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JOURNAL OF MAMMALOGY

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WHITE-TAILED DEER FORMERLY IN THE YELLOWSTONE PARK

BY M. P. SKINNER

[*Plates 8–9*]

The Location of the Park. The Yellowstone National Park is a large and diversified area of 3348 square miles, lying mostly in extreme northwestern Wyoming, with narrow strips extending over the borders into Montana and Idaho. Its lowest point is at the junction of the Yellowstone and Gardiner rivers, on its northern boundary, where the altitude above the sea is 5300 feet. Six miles west from this low point is the summit of Electric Peak, 11,125 feet high, and the highest point in the park.

Zonal Divisions. The lowest elevations are open, except for sage-brush, the trees along the largest streams, and the thickets of brush along the smaller ones. If there is any of the Sonoran Life Zone represented in the park, it is by very limited areas in this comparatively treeless, sage-brush-covered, open country. The Transition Zone, however, is a little larger in area in the Yellowstone. Here, at least, it is well named, for it is truly "a transition" from the drier, treeless lowlands to the cooler, higher uplands. In it the groves of aspens (*Populus tremuloides*) and Douglas firs (*Pseudotsuga mucronata*) dot the lower mountain slopes, otherwise covered by a luxuriant growth of grasses and low herbage.

A large share of the park is a lofty, rolling, volcanic plateau varying in height from 7000 to 8500 feet above sea-level, but broken in places by isolated peaks and ranges of mountains rising to 10,500 and even 11,000 feet. Most of this plateau is covered by forests of lodgepole

pine (*Pinus murrayana*), alpine fir (*Abies lasiocarpa*) and spruce (*Picea engelmanni*), and is Canadian Life Zone in character although an important part is high enough to lie in the Hudsonian Zone. The heights above 9500 feet are bare open tracts in the Arctic-Alpine Zone.

Habitat of the White-tails. So far as the white-tailed deer (*Odocoileus virginianus macrourus*) were concerned, the plateau lands and the higher mountains were unavailable, for these deer kept to lower altitudes, with perhaps a few individuals following, in summer, the tongues of aspens that stretched up into the lodgepole forests of the park plateau. While these white-tailed deer were frequently seen in groves of cedars (*Juniperus scopulorum*), Douglas firs, or limber pines (*Pinus flexilis*), they were peculiarly the deer of the aspen groves and the thickets of tall deciduous bushes, such as the several species of willows (*Salix*), alder (*Alnus tenuifolia*), birch (*Betula fontinalis*), chokecherry (*Prunus melanocarpa*), and serviceberry (*Amelanchier alnifolia*).

Although now the white-tailed deer have disappeared from the park, they were formerly an integral part of the fauna. They were by nature inhabitants of the brushy areas along rivers and streams, and were inclined to withdraw quietly from sight whenever man came upon the scene. On the other hand, the mule deer (*Odocoileus hemionus hemionus*) were lovers of the open hillsides and the mountains. When startled, the mule deer preferred to bound away over the hills and through the more or less open coniferous forests, while the white-tailed deer slipped quietly away under cover of the brush. Even had the two species been equal in numbers in the Yellowstone, these different habits would have caused the mule deer to have been much more frequently seen. But the Yellowstone was not everywhere a good range for the white-tailed deer, and what suitable area existed was so limited that they were never very numerous.

Former Literature. Quite naturally, since these deer were seldom seen by anyone, they were not noted by the early scientists and other visitors to the park. As was to be expected, it was the residents of the park that first knew of the white-tailed deer's presence. Former superintendent P. W. Norris says on page 39 of his annual report for 1880: "White-tailed Deer. These animals do not differ essentially from those of the Atlantic States in size, color, horns, or habits. They usually frequent the densely timbered valleys and foot-hills, are more shy, sharp-eyed, and fleet, and less migratory than the black-tailed variety." There are more references of a later date, and at the end of this article I have gathered together all of them that I can find. Most of them are

but a few words in length, and all combined would cover only a little more than a page of the JOURNAL OF MAMMALOGY.

Description. White-tailed deer are easily distinguished from the more common mule deer by the shape of their antlers. The antler of a white-tailed deer has one main beam, rising from the top of the skull and sweeping forward in a graceful curve; from this main beam, one to six points, or short tines, grow upward. While the antlers of the mule deer originate equally from the top of the head, they do not curve forward but grow upward and fork into two equal beams, each of which again forks higher up, and perhaps reforks, into two equal branches, or tines, at each division. The ears of the white-tail are much smaller and more delicately formed than the really large ears of the mule deer. The tail of the white-tailed deer is broad and dark brown, edged with white above, but all white below. On the other hand, the mule deer has a smaller, rounded tail, white both above and below, and tipped with black. The general color of the white-tailed deer is more reddish in summer and more brownish in winter than the mule deer. They are a little smaller as a rule, but even then the largest white-tail bucks weigh about two hundred pounds each, although the does are smaller.

In the Yellowstone the name "white-tailed" was something of a misnomer. True, their undertails were white, but these park deer did not raise their tails and wave them so conspicuously about as seems to be the habit of the animal elsewhere. And when their tails were down in the normal position, they were brown or gray, with a light edging of white. In fact, the mule deer had a much whiter tail. Even the elk's great light-colored buttocks were more conspicuous than the amount of white on *macrourus*.

The summer coat of the white-tail is a dull red, or yellowish brown, lighter in color around the eyes and on the nose, chin and throat. The other upper parts are uniform in color except that the upper tail is darker. The inside of each leg, the belly, the underpart of the tail, and the region beneath the tail, are white. In winter, gray replaces the reddish, or brownish, color.

The white-tailed deer were the daintiest and most graceful of all the Yellowstone mammals, especially when in motion. Their normal gait was both a trotting and a running one, with an occasional high leap into the air. But they did not "bound" with all four feet striking close together, and at the same time, as the mule deer did. Nor did they gallop with such headlong, astounding speed as the frightened prong-horn antelope did. The white-tails trotted or ran away with heads up

and a graceful, jaunty, springy step that was beautiful to see. Although very graceful, these movements also carried the deer rapidly out of danger. In the park, the big white tail was not often carried aloft, but sometimes it waved from side to side as its owner disappeared.

The eyesight was not good for motionless objects, although quick and keen to detect the slightest movement. Whenever a white-tailed deer found me under the trees or even out in the open sage-brush, it would peer curiously at me for a minute or two without recognizing me for what I was. For the instant I moved, a sudden start by the deer would show that it had only then suspected the still, motionless object to be a man. On the contrary, their noses were very keen, and were depended upon to warn their owners of any enemies that might be near.

Range. In winter these deer were seen mostly along the Gardiner River and on the hills between Undine Falls and Rustic Falls on the one side, and the town of Gardiner, Montana, on the other. A small group wintered near Tower Falls; and a few lived near the Snake River and other streams of the southern parts of the park. With the coming of summer, they worked up the streams from the wintering grounds. The farthest up I ever saw one was near Apollinaris Spring on August 6, 1917, and consequently eight miles from the nearest winter range. In summer, they generally kept to the stream bottoms, and to the willow and alder thickets, so that they were seldom seen; but in September and early October they began to seek the wintering grounds again, and from that time until the following May they were seen out in the open more. They were even at times on the sage-brush hills, although never so conspicuous as the higher-headed mule deer. The white-tailed deer came about Mammoth all winter, although they were as a rule more shy than the mule deer. At times they were out on the stubble field just inside the North Entrance at Gardiner, and sometimes on the Chinaman's garden between Mammoth and Gardiner. White-tailed deer were often seen on the hot-spring formation at Mammoth where they probably sought out saline matter. After winter was over, these deer were attracted to the lowlands by the first green vegetation, before they could get similar food elsewhere.

Relation to Other Species. White-tailed deer were often with mule deer and even with elk, and once on January 20, 1920, I saw some with antelope on the field near the north entrance. In the case of the elk and the antelope, it was evidently a desire for similar food, and not social tastes, that caused the temporary association. But the mule deer actually seemed to have some social attraction. To be sure, I have

seen white-tail bucks drive mule deer away from food, and away from white-tail does and fawns. But during 1921 and 1922 it was noticeable that the last living white-tail buck kept so much with mule deer that he was seldom seen except in their company. White-tailed deer fawns and mule deer fawns, more than five months old, were sometimes found together, even when there were no adult deer near.

Home Range of the Individual. In winter, certain of the Yellowstone white-tailed deer that bore distinguishing marks so that they could be readily recognized, were known to travel frequently from Undine Falls to Gardiner (about seven miles) and were often seen the same day in places as much as four miles apart. At times they left the park and wandered down the valley of the Yellowstone, crossing the farms and intervening ranches on their way. These seemed to be erratic wanderings due to food scarcity or to changes in the weather, and were indulged in by deer of all ages and even by family parties. I have every reason to believe that the movements of bucks, barren does, and especially does with fawns, were very much less in summer, and that the animals then never went far from a chosen home locality as a center.

Migration. As already noted, there was a limited annual migration between winter range and summer range, but the extreme travel was probably less than ten miles. Still, it was thought by some people that the reason the white-tails decreased was because they left the park and intentionally sought another range. But it is much more likely that the traveling deer that failed to return to the Yellowstone National Park were shot during their journeys outside the park protection. Although the travels up and down were limited in extent, they were as truly migratory as though the deer had covered hundreds of miles each season. In this respect, these Yellowstone deer seemed to have differed from those living elsewhere, for I find it generally stated by other authorities that white-tailed deer are non-migratory. The fact that these deer performed a limited migration, sufficiently long to carry them away from the deep snows of their highest range, enabled them to dispense with "yarding." Yarding was not practised in the Yellowstone because it was not needed on the comparatively snow-free areas the white-tails ranged over in winter.

Population. The Yellowstone National Park was probably never a home for many white-tailed deer although they were known to be present as early as 1880, and had probably lived there for a long time before their discovery was published. It is likely that the old estimates of a hundred white-tailed deer were correct previous to 1916.

During the winters between 1913 and 1920, I saw them practically every day that I was at Mammoth, varying in numbers from one to as many as nineteen different individuals seen on January 18, 1915, and on February 12, 1915. But during this period of years there appeared to have been a steady decline in the size of the population. For, during the years:

1914. I saw them on 61 different days and the largest number seen on any one day was 14
1915. I saw them on 81 different days and the largest number seen on any one day was 19
1916. Although I was on their range only a few days during this year, I saw them on 10 different days and the largest number seen on one day was 8
1917. I saw them on 30 different days and the largest number seen on any one day was 10
1918. I saw them on 31 different days and the largest number on any one day was 12
1919. I saw them on 15 different days and the largest number on any one day was 4
1920. I saw them on 39 different days and the largest number on any one day was 6
1921. I saw them on 29 different days and the largest number on any one day was 5

I first noticed that the white-tailed deer were declining in numbers in the autumn of 1917 when I failed to see them every day and in the numbers usually seen previous to that year. From that time on, they steadily decreased. In 1921, on March 27, five white-tailed deer, of which at least two were bucks, were seen together at Mammoth, and although I found a white-tailed deer badly injured on April 4, 1921, and it died the next day, at least three white-tailed deer survived until June 11, when I saw that number together east of the power house near Mammoth. That year I was absent from the park after September 25. When I returned on May 6, 1922, I was informed on good authority that these three deer were seen going down the Gardiner-Yellowstone valley as far as Cedar Creek (about twelve miles north of the park boundary). The chief ranger of the National Park Service told me that he afterwards saw these deer near Cedar Creek once or twice, but that they soon disappeared.

A five year old buck white-tailed deer on May 15, 1922, was the only one seen by me during that year until fall when I saw the same

buck several times about Mammoth, and also another buck of similar size was seen once on November 25, 1922. I never saw this second buck again, but the first one survived until the winter of 1923–1924, and then died from eating fox-tail grass.

Causes of extermination. It is unknown just what caused the extermination of the white-tailed deer, but no doubt accidents, cougars, coyotes, and emigration all had their part. But since all these destructive forces had operated for years, it was more probable that man was responsible for finally turning the scale against them. That the white-tailed deer should have been the first animal to disappear in the Yellowstone seems very strange indeed, for elsewhere they have been very resourceful and able to maintain themselves long after all other large animals have been locally exterminated. Over most of their range, the white-tailed deer withstood the improvements and changes wrought by man, and were often able to live in a comparatively small patch of wilderness. This they could do because they were adaptable, and quick to suit themselves to changing conditions.

Here in the Yellowstone Park and vicinity, the white-tailed deer met a set of conditions that proved too much for them. Although I have no convincing record of white-tailed deer killed by wolves in the park, it is interesting to note that wolves were first seen in numbers in the Yellowstone National Park in September of 1914 and that it was shortly after that date that I first noticed the white-tailed deer were decreasing in numbers. It is my opinion that the previous tendency of the white-tails to leave the park and wander north along the Yellowstone valley became stronger because of the presence of the wolves. Since all the land along the Yellowstone River north of the park was cleared, and covered by farms and ranches, the white-tails had no thickets there in which to hide. Furthermore, the hunting of deer was allowed there at times. These park deer were tame and unsuspicious, and it was so comparatively easy to kill them that I believe they fell victims to a senseless slaughter whenever they were out of the park, and before they realized they had left its protection. With the death of the last buck during the winter of 1923–1924, the white-tailed deer was the first animal to become extinct in the Yellowstone National Park in modern times.

Unfortunately, this subspecies, *Odocoileus virginianus macrourus*, is now slowly and surely being exterminated throughout its range. Now that the effort is being made to protect the mule deer, antelope, and elk in the Yellowstone valley north of the Yellowstone National Park, it would seem as if it might be well to re-introduce this white-

tailed deer into the park, and see if it can not be protected and saved under the changed conditions.

Seasonal Change of Pelage. In summer, the color of the adult white-tailed deer in the Yellowstone Park was yellowish brown, but about September 20 each year, the new hair, gray in color, began to push through and replace the summer coat. By October 10, the process was usually complete and all the white-tailed deer were "in the blue coat," as it was mistakenly called. This rule had its exceptions, however, for a weak or sickly animal was late in changing color, and usually fawns were later than adults. Several times I noted a gray mother with fawns still brownish. On October 14, 1915, I saw a mother deer showing only a few red hairs through her gray coat, but her fawn was "yellow"; on September 30, 1919, a mother was almost completely changed to gray while her two fawns were still quite brown. My records show that in:

1914. On September 28, all white-tailed deer were changing to gray, and three days later many of them were completely changed. All were gray on October 15 except one small fawn.

1915. On September 21, 25 per cent of the white-tailed deer were changing, and the remainder, mostly young, were still brown.

1916. On September 27, all mature white-tailed deer were gray.

1919. On September 15, all white-tailed deer were still brown, but, by September 30 all except the fawns were gray.

1920. On October 11, all the white-tailed deer were gray.

Consequently these changes took place at approximately the same date each year, and were not directly connected with temporary changes of weather and temperature.

After the middle of October in average years, the gray coat kept on growing heavier and heavier until winter settled down; and after that, the deer's coat maintained its weight and warmth until about May 1, when the long hairs began to fall out, showing the new and shorter brown coat coming in underneath again. Usually the white-tailed deer were completely brown after June 10.

Antlers. I never saw a female white-tailed deer with antlers, but all the bucks carried their old antlers throughout the winter and shed them each year.

In 1915 the first antler was shed January 29, the last one, March 21.
In 1918 the first antler was shed February 13, the last one, March 4.
In 1920 the first antler was shed January 27; the last one, February 17.
In 1923 the first antler was shed January 24; the last one, February 1.

Sometimes both antlers fell together and sometimes as much as eight days intervened between the falling of the two from the same deer. Old and sickly animals shed their antlers earlier than healthy animals, but seasonal changes of weather appeared to have no direct effect. Usually by March 15 each year, the antler butts left on the deer's head had become covered with skin and had begun to swell but I could not see that the new growth was any quicker to start on the first deer to shed, than on the last. This would naturally be the case, for the weak animals whose antlers fell first, did not have the vitality of the healthy animals whose antlers fell later. And this added vitality enabled the healthy animal's new antlers to start growing sooner after shedding the old. It always seemed to me that practically all the antlers started growth at, or about, the same time. On poor animals, or in poor forage seasons, the antlers grew slowly. On all the bucks, as the food became better, the antlers grew faster. As I said before, the average antlers started to grow March 15; they were one inch long by April 15; two and a half inches long by May 1; five inches long by May 15 (because the forage improved markedly after May 1); and two-thirds grown, or twelve inches long by June 25. The red, swollen butts had, by this last date, grown into fuzzy, swollen pedicles somewhat larger in diameter than the finished antler would be at that point. The angry red of the first stage gradually became less fiery and more horn-like in color, but still the young antler contained a mass of rich, red blood vessels that persisted until the end of July. At the right time and at the right place, each new tine grew naturally in the right direction. Both the main beams and the tines had each a flat, blunt swelling at its tip. Later, these blunt tips gradually shrank in size at the final points. But even at the final stage of growth, the new antlers were still "in the velvet" and were soft and very sensitive. After the antlers had reached the final size, they gradually hardened, the blood vessels dried away, the nerves deadened, and the soft, fuzzy skin, or "velvet," that had covered the horns since March, began to wither and grow black. Possibly the antlers began to itch at this stage; at any rate, their owners rubbed them on bushes and trees until the last shreds of skin were removed and the new antlers were bright and clean, and their points sharp and serviceable.

While the growth of the new antlers depended at the beginning upon the condition of the bearer, later on, it depended more upon the quantity and quality of the available food. During the growth of the antlers, the buck avoided hitting them. If they were hit accidentally, they

might be injured or even made to grow abnormally thereafter. But after the antlers were properly hardened, they became so strong a man could scarcely break one with a sledge. Even so, the bucks occasionally broke one in their furious battles with their rivals.

During the time its antlers were growing, each buck stayed by himself, or at most, three or four bucks remained peaceably together. But there was so close a connection between the antlers and the generative organs, that the completion of the antlers about September 20 seemed to awaken slumbering passions, and then frequent fighting broke out between rival bucks.

Rivals. Before mating time, the battles between the bucks were common, but they were more like trials of strength and agility than like intentional killing battles. It was really seldom that a contestant was ever even scratched, although they might strain and push each other about for an hour or more. And the panting breaths and fierce bloodshot eyes plainly told of the tremendous efforts exerted. But the very fact that the bucks fought head to head, and antler to antler, prevented them from reaching vital spots and hurting each other. Finally, when one became exhausted, or was convinced it was overmatched in strength or agility, it sprang away and retreated. At the moment of separation there was always a chance that the antlers of the victor might reach an unguarded flank, and then cause serious hurt. On the other hand, I never found any evidence of locked antlers among our white-tail fighters. After the season of fighting by the rival bucks was well under way, their n cks began to swell about October 1 and soon thereafter the pursuit of the females began. Up to this time, the bucks had been indifferent to the does, but with the beginning of the "mad moon" all this was changed.

Mating. Usually the bucks were ready to mate from two to three weeks before the females were. So that early October was a season of futile chasing by the bucks, and of hopeless efforts to escape on the part of the does. Hopeless, because the buck, although he seldom caught a doe, was relentless in his pursuit and hardly stopped even to eat. Sometimes two or more bucks would follow the same doe, usually the biggest and finest buck in front, trailed at a safe distance by a smaller buck, and sometimes by a second and still smaller one. Should, by chance, an equal or larger buck fall in behind another buck on a trail, he was likely to overtake the first one and a pitched battle would follow for the place of honor. After two or three weeks of this early madness, the female deer became less shy and gradually one after another allowed

herself to be caught. After that the newly paired deer remained together for a short time, but seldom more than a week or ten days. There was no indication that a buck sought out the same doe each year, but there were many indications that each buck sought another mate as soon as the first one went out of season. Still, this was slightly different from the "harem" habit of the elk, for although a buck white-tailed deer might have two or more mates each year, he finished with one before he began his pursuit of another. The rut usually lasted until the end of November (November 26, in 1917) although snowy weather had a tendency to shorten it, because the deer then needed greater time to secure food. A month usually covered the actual mating season, and this was shorter than like periods observed elsewhere, outside the park.

Food. In summer, the white-tails ate mostly leaves and twigs of various trees and shrubs, herbaceous plants and grass. As the winter snows covered other food, the deer depended more and more on browse, and increased their eating of willow shoots and aspen bark to a noticeable amount. Since these deer were naturally more given to browsing, it was not strange that their eating of willow shoots was greater than that of the elk. When any branches, or tops, of the limber pine, Douglas fir, or Engelmann spruce were cut down by us, or thrown down by the winter storms, the deer quickly ate the needles and smaller twigs. In a similar way, the foliage was eagerly stripped from discarded Christmas trees, mostly Douglas firs.

These branches and Christmas trees were the most natural food provided by man, but hay and cut alfalfa were often spread for them, and occasionally a kind-hearted barn-man would leave some oats out for these deer. Throughout the winter, the white-tailed deer used to come to the kitchen doors at headquarters for any scraps of green food, bread and crackers that they could get. This tameness and friendliness with man had one very unusual feature. Outside the park, where white-tailed deer have been kept as pets, and even in zoological gardens and deer preserves, tame deer have proven unreliable and dangerous. For as they acquired familiarity with man, they lost their fear, and sooner or later attacked some luckless human being. To most people, a deer, especially a female, seems like a gentle, comparatively harmless animal. Yet, when it was aroused and fearless, it became a raging demon that eventually killed any human antagonist unless a club, or other effective weapon, was handy. But here in Yellowstone Park, although the white-tailed deer became tame and seemed to lose all fear of man, I have never heard of their attacking or hurting anyone. Not a single one of

even the smallest children that played near the deer so often was ever hurt. Why this was so, has never been explained, but it was a matter of much surprise and astonishment to those of us that knew the disposition of "tame" deer elsewhere. Although never as tame as the mule deer, in at least one instance I saw one take food from human hands on December 19, 1919. White-tailed deer were common, at least in winter, on the garbage dump near Mammoth where they probably secured scraps of food and bits of salt of which they were very fond. But some of the deer paid a high price for this garbage-dump food, for they often cut their feet badly on the numerous sharp tin cans there.

Drinking. Deer frequently were seen taking long drinks at the edges of various mountain streams. They seemed to need water regularly, and presumably drank at least once or twice every day. On April 21, 1921, I saw four of them drinking of the cooled hot spring water flowing from the Palette Spring at Mammoth Hot Springs. In this case, possibly the mineral contents of the water were salty and therefore attractive, for these deer liked both salt and alkali.

Diurnal and Crepuscular. Although in winter the white-tailed deer were about at all hours of the day, even at noon, they showed a marked preference for twilight at warmer seasons, and for the hours nearest sunset and sunrise. The white-tails also moved around at night, especially when the moon was shining, although not to any great extent even then.

Resorts, Beds. No established bed or resort at any season was the rule, and seldom was any bed ever used a second time. Usually a deer would lie down in the best place nearby, whenever the inclination appealed. These beds were made and occupied both by day and by night. In some instances, I have reason to believe the same bed was occupied all night, but usually I thought that the deer moved at least once or twice during the night, even if undisturbed by outside influences. Since the deer were usually in, or near, thickets and bottomlands along streams, that was where their beds were usually found. On March 23, 1921, I found five white-tailed deer in their beds under a cedar behind my quarters at Mammoth, and, from the undisturbed condition of the fresh snow, I have no doubt they had been there all night. On January 18, 1920, I found two white-tails away from all trees of any kind, but lying under some sage-bushes.

Gestation. Since this period lasted from approximately November 1 to about the end of the following May, it was just under seven months long.

Young deer were born during May and usually there were two at a time, but occasionally only a single fawn. I saw no evidence that does gave birth to young until the does were at least two years old. That is, they did not mate until the second autumn of their lives. In most cases, therefore, the does were three years old when they had their first fawns. Usually it was the very young and the very old does that had only one fawn at a birth. After birth, the fawns remained hidden in, or near, their birth place for three weeks or more. Then they began each day to follow their mothers for short trips, gradually lengthening them Yet they were very shy and were still kept hidden by the mother when she could do so; and I seldom saw any of the speckled fawns until early July when the earliest ones to be born began to appear. When small, these fawns were thickly spotted with white spots the size of a nickel. This baby coat was worn only until September. The spots were then lost and the fawn became brownish all over. I have seen spotted fawns as late as September 15 (1919), and then again I have known them to lose their spots before September 1 (1920). Usually it was a month or more after the spots were gone before the fawns began to acquire the gray coat. The last fawn I ever saw in the Yellowstone was one of a pair of twins seen at Mammoth on September 1, 1920.

Behavior of Adults after Birth of Fawns. Throughout the summer the two sexes remained separated; the mothers taking care of their babies, the barren does and the bucks singly or in small groups, but each sex by itself. During the rut, the males sought their mates, even though the does might still have their last fawns with them. In winter both sexes and fawns were together in small mixed groups.

Hybridization. Although some people often found antlers that they considered showed hybridization, I could never convince myself that these horns even indicated such a state of affairs. Certainly I have never seen any other sign of hybridization and do not believe it occurred, at least in a state of nature. Even in the case of Yellowstone's last surviving buck, who was healthy and lived through two rutting seasons without a white-tail mate, I saw no evidence that he approached the female mule deer about him.

Sociability with Other Species. Normally the white-tailed deer and the mule deer were not seen together. In winter, the same food drew them to the same sections and they then seemed to be more or less sociable. In the case of the last and surviving white-tail, he was usually with one or more mule deer bucks, at least in winter. Several times I have seen white-tailed bucks drive off mule deer bucks when they desired, even if the mule deer were manifestly larger. On February 26,

1918, I saw a white-tailed buck, although smaller, drive off all mule deer bucks when they came too near the white-tailed does and fawns. On February 11, 1923, a white-tailed buck without horns drove away a larger mule deer buck that still had horns, when I offered the two of them some scraps of vegetables.

Not Gregarious. White-tailed deer were seldom seen, even in winter, in groups of more than four or five. In summer, two to four bucks often seemed to live more or less together.

Disposition. In time, the white-tailed deer became tame enough to visit our kitchens and barns in winter for food. But on another occasion, I was still more impressed with their tameness. On March 18, 1920, I fired a twelve-gauge shotgun near Mammoth, and three white-tailed deer, within 125 yards at the time, paid absolutely no attention. Guns were seldom fired in the Yellowstone National Park and these deer had probably never heard one before. Of course, they did not know what it meant, but on the other hand such a sudden, sharp, unknown noise should have startled them.

Amusements. On July 8, 1917, a three-week-old fawn was seen in very playful mood, dashing about in high spirits and cutting capers like a colt. In spring, particularly in early June, white-tailed deer, yearlings and adults alike, were often very sprightly and playful. At such times, I have seen one yearling chase another about, and even jump over it repeatedly.

Curiosity, Intelligence. The curiosity of the white-tailed deer was not great here in the Yellowstone National Park, and the lack of human enemies did not develop their acuteness. Their intelligence in avoiding enemies was only normal and not equal to that of white-tailed deer elsewhere, especially with those subjected to hunting.

Enemies. The cougar, wolf and coyote probably all killed the white-tailed deer when they could, and the decrease of the numbers of white-tailed deer so soon after the gray wolves first became common was suggestive. Accidents were common: on April 4, 1921, I examined a deer at Mammoth that had the side of his head badly bruised and broken, and I thought at the time that a horse had kicked it. In the fall and winter, I sometimes found one dead, possibly "winter-killed," possibly some other cause.

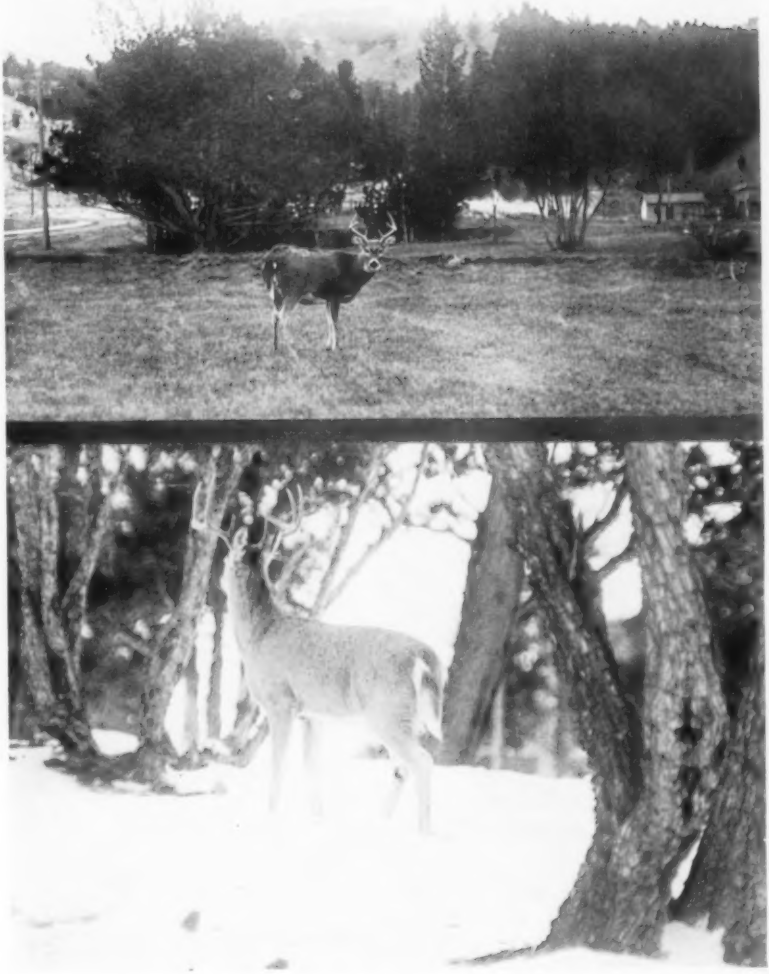
Insect Pests. Undoubtedly mosquitoes, deer flies, and ticks all decreased the vitality of the white-tailed deer at times. Possibly none of them would kill a deer, but they weakened a deer at times so that it readily fell a victim to other causes.

Growth. Full size was reached during the second summer when the

LEFT FIG. A PAIR OF WHITE-TAILED DEER

RIGHT FIG. A PAIR OF YEARLING WHITE-TAILED DEER

UNIV. OF MICH.



UPPER FIG. THE WHITE-TAILED BUCKS BECAME VERY TAME AT MAMMOTH
LOWER FIG. A WHITE-TAILED BUCK IN WINTER

deer were about fifteen months old. The size of the antlers was not a sure sign of age, although the main beams usually grew larger and heavier each year until old age began. A five-year-old buck seen on October 31, 1922, had four prongs on the left antler and three prongs on the right; and another five-year-old had three prongs on one antler and two on the other on November 25, 1922. Females reached normal mating age when thirty months old, and the males not until the next rut when they were over three years old.

REFERENCES TO THIS DEER IN THE YELLOWSTONE NATIONAL PARK

1881. Norris, P. W. Annual Report of the Superintendent, 1880. Government Printing Office, Washington, D. C. P. 39.

1893. Hague, Arnold. The Yellowstone Park as a Game Reservation. In: American Big-Game Hunting. The Book of the Boone and Crockett Club. Forest and Stream Pub. Co., New York. P. 259.

1906. Fountain, Paul. The Eleven Eaglets of the West. John Murray, London. P. 191.

1907. Beard, Dan. Dan Beard's Animal Book. Moffat, Yard and Co., New York. P. 250.

1913. Seton, Ernest Thompson. Wild Animals at Home. Grosset and Dunlap, New York. P. 221.

1913. Hornaday, William T. Our Vanishing Wild Life. New York Zoological Society, New York. P. 336.

1914. Roosevelt, Theodore. Wilderness Reserves. In: American Big Game In Its Haunts. The Book of the Boone and Crockett Club. Forest and Stream Pub. Co., New York. Pp. 29–30.

1916. Skinner, M. P. The Hoofed Animals of the Yellowstone. American Mus. Journ., vol. 16, no. 2, pp. 91–95, February.

1918. Bailey, Vernon. Wild Animals. In: Rules and Regulations, Yellowstone National Park. U. S. Dept. Interior, National Park Service. Government Printing Office, Washington, D. C. P. 53. (This annoted list appeared in subsequent editions each year up to, and including, 1923.)

1921. Skinner, M. P. Dates of Shedding of Horns in Yellowstone Park. Journ. Mammalogy, vol. 2, no. 2, p. 116, May.

1921a. Skinner, M. P. Horn Shedding in Yellowstone Park. Journ. Mammalogy, vol. 2, no. 3, p. 172, August.

1924. Skinner, M. P. The Yellowstone Nature Book. A. C. McClurg and Co., Chicago. P. 104.

1925. Heller, Edmund. The Big Game Animals of Yellowstone National Park. Roosevelt Wild Life Bull., vol. 2, no. 4, pp. 409, 448–453.

1927. Bailey, Vernon. Animal Life of Yellowstone Park. Sierra Club Bull., vol. 12, no. 4, p. 336, San Francisco.

In addition to the above, there were occasional mentions in the annual reports of the superintendents of Yellowstone National Park, beginning in 1907.

Jamestown, New York.

A NEW LABORATORY CAGE FOR SMALL MAMMALS, WITH NOTES ON METHODS OF REARING PEROMYSCUS

By Lee R. Dice

For the rearing of wild small mammals the usual laboratory cages have not proved very satisfactory, and for these wild forms a new type of cage has been developed at the Museum of Zoology. This has been in use for several years and in it there have been satisfactorily reared large numbers of deer mice (*Peromyscus*) and house mice, as well as smaller numbers of red-backed mice (*Clethrionomys*) and harvest mice (*Reithrodontomys*). The advantages of the new cage are the slight danger of individual animals' escaping while being handled, the rapidity with which a large number of cages can be provided with daily food and water, the ease of cleaning, and the low cost of construction.

The inside dimensions of the cage are $10\frac{1}{4}$ inches wide, $14\frac{3}{8}$ inches long, by $6\frac{1}{2}$ inches high. The cage is simple in design, and the only tools necessary for its construction are square, saw, hammer, auger, and tin shears. When built in quantity, the cost per unit, including labor, is about two dollars.

The cage is constructed of wood blocks, on which is tacked galvanized wire screen to form the sides and front. The top is mostly a wooden lid, which is held in place by weight alone. The bottom of the cage is an enameled iron pan, in which the upper part of the cage rests. The cage then is in three parts and can easily be separated for cleaning.

For constructing one cage the following dressed wood blocks are needed:

1 piece yellow pine $\frac{3}{4}$ x $6\frac{1}{4}$—14 $\frac{15}{16}$ inches long: lid
2 pieces yellow pine $\frac{3}{4}$ x $1\frac{1}{4}$—$15\frac{1}{2}$ inches long: top strips
1 piece yellow pine $\frac{3}{4}$ x $6\frac{1}{4}$—$10\frac{1}{4}$ inches long: back
2 pieces soft wood $\frac{3}{4}$ x $1\frac{1}{2}$—$7\frac{1}{2}$ inches long: lid runners
2 pieces soft wood $\frac{3}{4}$ x $1\frac{1}{2}$—$10\frac{1}{2}$ inches long: front and back strips

These wood blocks are best prepared in quantity in a wood working shop. The cages can then be nailed together as needed.

The lid is made by nailing a lid runner across each end, allowing about $\frac{1}{2}$-inch of the runner to project beyond the end of the lid. To prevent the mice chewing the edges of the wood it is necessary to nail a strip of galvanized iron, 1 x $14\frac{3}{4}$ inches in size, along each lower outer edge of the lid.

To construct the body of the cage, first bore a $\frac{7}{8}$-inch hole in one of the top strips, the center of the hole being 2 inches from the end of the

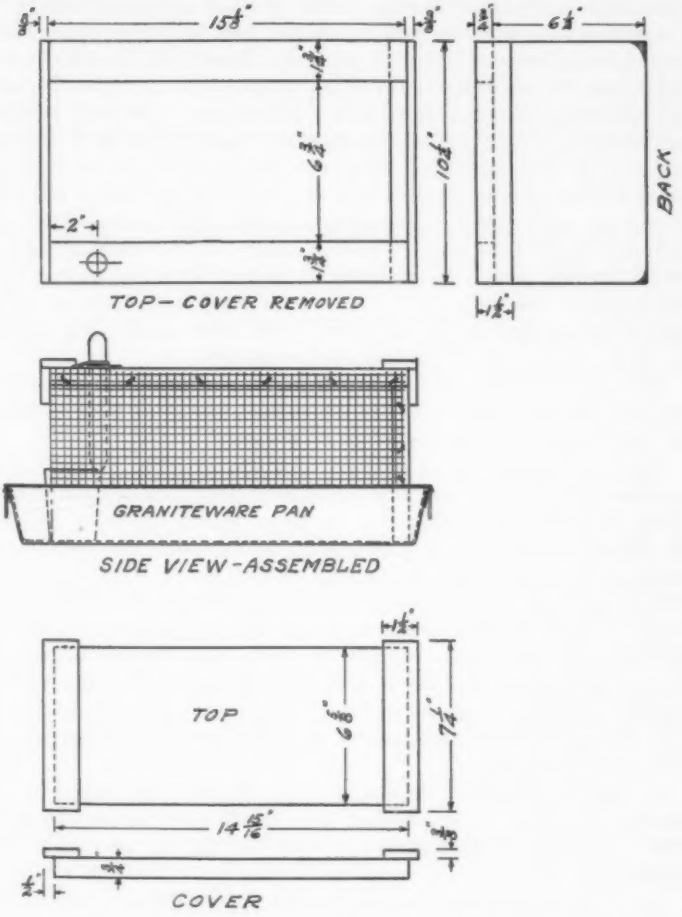


FIG. 1. DETAILS OF CAGE FOR SMALL MAMMALS

strip. This hole is to receive the water bottle. Tack wire screen trimmings along the underside of each of these top strips, except for one inch at the posterior end where the back will be nailed. These screen strips prevent the mice gnawing. Round off the lower outer corners of the back for about half the width of the wood, so the back will fit into the rounded corners of the bottom pan. Also nail a narrow strip of wire screen across the inside lower edge of the back to prevent the animals from gnawing. Nail the top strips to the back, allowing space for the lid to fit between with about $\frac{1}{8}$-inch clearance on one side. Now tack on a length of $\frac{1}{3}$-inch mesh galvanized wire screen to form the sides and front of the cage. The width of the piece of screen will be $7\frac{1}{4}$ inches, and the length a little under 41 inches. It is best to first tack the screen at the top corners, and then straighten the cage on a flat surface before fastening it to the lower part of the back. The cage is completed by nailing on the front and back strips.

The pan forming the bottom of the cage is a seamless enameled baking pan 12 x 18 inches in outside dimensions, and about 2 inches deep. It can be procured from any hardware dealer.

Water is supplied by an inverted test-tube, of which the open end has been heated in a flame until the opening has closed to a round hole about 4 millimeters in diameter. A heavy walled test-tube, without lip, and 18 x 150 mm. in size, is best for the purpose. To support the water bottle a short length of 16-gauge galvanized wire is sprung around it in a tight coil, about 1 inch from its upper end. One deer mouse learned to pull the water bottle down into the cage and escape through the opening. The mouse was able to do this even though the coil of wire was sprung on the tube very tightly. It was finally foiled by our slightly expanding the upper end of the water tube, so that it would not pass through the opening in the board. This need not be done except in very unusual cases.

A brass label holder to take a card $2\frac{1}{2}$ x 1 inches is attached to the middle of the front strip. Here it is on the front of the cage in plain view. A supply of label cards of proper size can be cut by any job printer.

The food receptacle is a "squat beverage glass" $3\frac{1}{8}$ inches high and $2\frac{1}{2}$ inches in diameter at the open end. Any tumbler or cup with straight sides could be used. Slits are cut in the wire screen at the front end of the cage so that the glass cup can slip up on the screen, half of it being inside the cage and half outside. Powdered food placed in the part of the cup outside the cage will work through the meshes of the screen and

can be eaten by the mice inside the cage. The screen is cut so that at the top the opening is the full width of the glass, but at the bottom the cut edges overlap the glass slightly. The glass is placed in position with the bottom a little more inside than outside the cage. A short piece of soft 22-gauge wire encircles the glass on the inside of the cage and the ends are attached to the cut edges of the screen. This prevents these edges from flaring out and leaving an opening through which mice

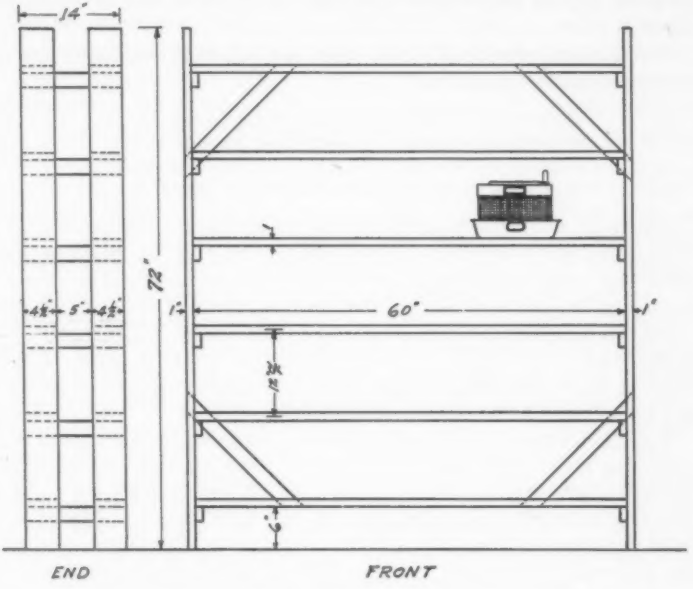


FIG. 2. CONSTRUCTION OF RACK FOR HOLDING CAGES

could escape. If properly adjusted the wire need not be unfastened when one removes the glass for cleaning, but the glass can be rolled out of position and then pulled off.

To hold the cotton nest-materials, and prevent their being scattered over the floor of the cage and soiled, a small light aluminum pan is used as a nest pan. A convenient size is a one-quart sauce pan from which the handle has been broken off.

If only a few cages of mice are kept they can be placed on a table or

bench, but if any considerable number are in use it becomes necessary to keep them on shelves or racks. The rack that I use holds 30 cages when completely filled and is easily and cheaply constructed. For a large collection these racks are arranged end to end and back to back, leaving alcoves between them. In this way a large number of cages can be kept in a relatively small space. It is not desirable, however, to crowd the passageways in the alcoves narrower than about 36 inches, or there will be difficulty in stooping over to take care of the lower cages.

For the construction of a unit rack, holding 30 cages, the following pieces of lumber are needed:

2 pieces 1 x 5 inches—72 inches long, for ends
12 pieces 1 x 5 inches—60 inches long, for shelves
12 pieces 1 x 2 inches—14 inches long, for shelf cleats
4 pieces 1 x 2 inches—18 inches long, for braces

Yellow pine, no. 1, common, is satisfactory lumber for this use, and any handy man can readily saw out the lumber and nail the rack together. Each shelf is 60 inches long between the ends and the distance between shelves is 12 inches on centers. A space of about 5 inches is left between the two boards forming each shelf, as it is not necessary to have a solid shelf. The cages project beyond the rack about 2 inches on each end. A space of 6 inches is left below the bottom shelf so that there will be no place for escaped mice to hide.

The daily care of the mice consists in filling the water bottles and supplying food. The water bottles can be filled by placing the open end under a faucet, but when large numbers are to be filled it is quicker to use a special filling apparatus that can be carried to each alcove. This apparatus consists principally of a rubber tube about ten feet long, one end of which is placed in a bucket of water set on top of the highest shelf or cage. The lower end of the tube is provided with a brass nozzle small enough to go into the opening in a water bottle. A blow pipe with the small end filed off somewhat makes a satisfactory nozzle for this purpose. After a siphon is started the water will run from the bucket to the nozzle, the flow being controlled by a pinch cock on the rubber tube. The food dishes are filled with a small flour scoop, and the work can be done very quickly.

The standard food ration supplied the deer mice and house mice is composed of the following ingredients by weight:

	per cent		per cent
Corn meal	25.0	Linseed oil meal	5.0
Rolled oats	25.0	Powdered skim milk	1.5
Wheat middlings	25.0	Iodine salt	0.5
Dry meat scraps	12.0	Calcium carbonate, powdered	0.5
Alfalfa meal	5.0	Cod-liver oil	0.5

This ration is not claimed to be a perfect food, and it has been modified somewhat from time to time. In general it has resulted in the deer mice and house mice showing relatively high fertility, rapid growth of young, freedom from rickets, and usually sleek condition. Some individuals become too fat, and it is likely that a change in the proportions of certain ingredients might remedy this. A very essential element is the cod-liver oil, and the animals will not do well if this is omitted. A great advantage of the food's being in powdered form is that the animals can not easily store it in their nests, as they will whole grains.

In addition to the powdered ration, which is always present in abundance, there is given twice a week some kind of green food. This green food is usually lettuce trimmings, of which the mice are very fond, but in season carrots, spinach, or apples are substituted. Cabbage, turnips, or potatoes are not good foods and should not be fed.

The cages should be cleaned at least once a month and in warm weather more frequently. The mice are transferred one at a time to a clean cage with fresh bedding material. The dirty cage is then taken apart and scrubbed under the faucet in a large and deep sink. The pans and glasses will be more easily cleaned if they are partly filled with water and let soak for a few hours before scrubbing.

For bedding material cotton batting is good. The unsoiled parts need not be discarded when the cages are cleaned, but can be disinfected and used again. To disinfect the cotton it is placed loosely in a large ash can, and about one ounce of carbon disulfid is poured on the top layer of cotton. The cover is placed on the can and left to remain at least 12 hours before opening. This will completely destroy all parasites in the bedding.

A handful of sawdust or fine shavings placed in the bottom of each cage will absorb surplus moisture and assist considerably in keeping the cage clean.

The most serious parasites with which we have had to deal are fleas, scab-mites, and sucking lice. Cleanliness is the best method of controlling all of these. However, it sometimes happens that a litter of young arrives at an inopportune time and delays the cleaning of a cage. A small amount of pyrethrum powder blown into the nest and the

corners of the cages will assist in keeping down the parasites in such cases, but the cage must be cleaned at the first opportunity.

Scab is shown by a swollen and inflamed condition of the tail and sometimes of the ears and other parts of the body of the mouse. Eventually a scab is formed. Animals afflicted with scab are restless and irritable, and there often is fighting if several animals are together. The best cure that I have found is a light application of a spray of kerosene on the affected parts and surrounding region. A small DeVilbiss atomizer is used to apply the spray. The application should be repeated weekly until a cure is effected. Oil of pine needles is also useful to apply as a spray for scab and is somewhat more healing than kerosene, but not so effective. It can also be used for infections following scratches or bites.

For handling the animals it is best to use a 12-inch finger forceps. Deer mice and house mice can be seized best by the tail, but not within about an inch of the end, where the skin is tender. Some other small mammals, such as pocket mice, chipmunks, and wood rats, can not be held by the tail, as the skin readily breaks and the tail sheath slides off the vertebrae.

With the cage above described it is easy to catch even very wild mice with little danger of their escaping. The lid is moved to one end or the other leaving an opening of only a few inches into the cage. This opening is protected by the spread fingers of the left hand, while the forceps in the right hand are inserted into the cage and the mouse secured.

At intervals the cages may be inspected to determine if new litters of young have been born. For this purpose it is necessary to inspect only those cages containing mated pairs or possibly pregnant females. To indicate such cages I use a colored string attached to the wire handle of the pan forming the bottom of the cage. Different colors of string indicate mated pairs, pairs with young, pregnant females, unmated individuals, and so on.

The young of most species of mice are ready to wean at one month of age. However, a second litter of young will frequently be born to the mother before the young are that old, as the period of gestation in most mice seems to be about 21 days. It is good practice to catalog and mark the young at weaning time, and place the young males and young females in separate cages.

To mark the mice I use a combination of holes punched in the ears and of toes cut off. The mice are numbered serially and the marks

correspond to the numbers. The number of any mouse can then be read from its marks. This is essential if more than one mouse is kept in a cage, or if one escapes by accident, as sometimes happens. The marking of the young mice is done under anesthesia. The ears are punched at the specified places with a number 1 harness punch, and the specified toes are cut off completely with sharp scissors.

For anesthetising mice for marking or for identification they are placed in a small glass jar containing a wad of cotton onto which has been poured some ether. They are left in the jar only until they become quiescent.

Several different marking systems can be developed for mice. My system of numbers for *Peromyscus* runs to 3999 without duplication and without using the left ear or left hind foot, both of which are reserved for measurement.

On the right ear are marked units, indicated by holes punched at the edge of the ear. Five positions about the edge of the ear can be readily recognized, unit 3 being at the tip. Units 6 to 9 are indicated by two holes punched in various combinations. Zero is indicated by a single hole punched in the middle of the ear. Sometimes these punchings partially fill up again with flesh, but they can always be recognized, and there is seldom confusion with holes or tears secured in fighting.

Tens are indicated by cutting off toes on the fore feet. The inner toe on the left fore foot indicates, when cut off, 10, the next toe 20, and so on to 40, there being but 4 toes on the fore feet. The inner toe on the right fore foot indicates 50. For tens above 50 the inner toe on the right fore foot, indicating 50, is cut off, and also one toe of the left fore foot, whose value is added to 50. Thus the outer toe of the left fore foot, and the inner toe of the right fore foot, both removed, would indicate 90.

Hundreds are marked on the right hind foot, which has 5 toes. The outer toe indicates 100, the next 200, and so on to 500. For numbers over 500, two toes are removed, one of these being the inner toe, indicating 500, whose value is added to the value of the other toe.

Thousands are indicated on the right fore foot, the outer toe of this foot indicating 1000, the next 2000, and the next 3000. The inner toe, as already stated, is used in the tens series to indicate 50.

The records of the mice are kept on 3 by 5 cards in a steel card unit. The record of each mouse is kept on a separate card, which gives the serial number, species name, locality of origin, parents, date of birth, date of marking, matings, measurements and other desired information.

A separate card is kept for each mating and this gives the dates of litters and serial numbers of the offspring.

When mice are placed together for mating or to conserve cage space it sometimes happens that fighting takes place, especially at first, and sometimes a mouse is killed. This is most likely to happen if mice of different races are placed together. Different subspecies, however, differ markedly in their tendency to fight. Nearly always the mouse at home in the cage will attack the presumed intruder. Males are less likely to attack females, and for this reason it is advisable to place the female in the cage of the male, the two having been for a few days previously in cages side by side. A better method is to place both mice in a clean cage, where both are in equally strange surroundings.

With the deer mouse as with the house mouse it is not necessary to remove the male at the time of the birth of a litter of young. However, when the young are first born, the male, or any other female in the same cage, is driven out of the nest by the mother, who fiercely protects her young. It is, therefore, desirable to have enough nesting material in the cage so that two nests can be constructed at this time. When the young are several days old the male is re-admitted to the nest and all live in harmony. If a male is present in the cage the female usually becomes pregnant again shortly after the birth of a litter.

In a cage of the size here described, two mice can readily be kept, and if the sexes be separated, three mice do not crowd the space unduly. When short of cage space I frequently keep four or five or even a greater number of individuals in a cage. But any number greater than four is too many and should be reduced as soon as possible.

Museum of Zoology, University of Michigan,
Ann Arbor, Michigan.

BREEDING HABITS OF THE SHORT-TAILED SHREW, BLARINA BREVICAUDA

By William J. Hamilton, Jr.

[*Plates 10–12*]

Surprisingly little has been written concerning the breeding habits and home life of the short-tailed shrew, *Blarina brevicauda*. This is to be wondered at, for this species is often so common as to out-rank many of the smaller mammals in numbers.

NESTS

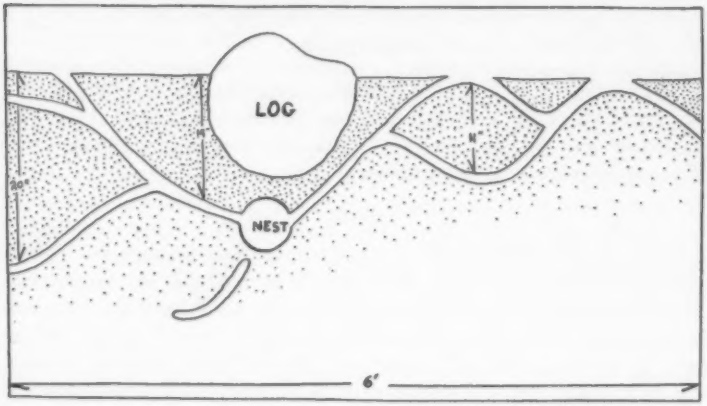
Nests are occasionally found when the burrows are opened. Shull (1907), in his excellent paper, describes the nests of this species as being 12 to 15 cm. in diameter. They were usually made from the leaves of grass, sedge, nettle, goldenrod and ash, arranged in the form of a hollow ball. One was composed entirely of the hair of a meadow mouse. Coarse material was used without being shredded or torn into smaller pieces.

Rhoads (1903) simply states that the nest is composed of grass and leaves in dry underground situations. Rowley (1902) states that the nest is found underneath a decayed stump, and is constructed of broken up leaves.

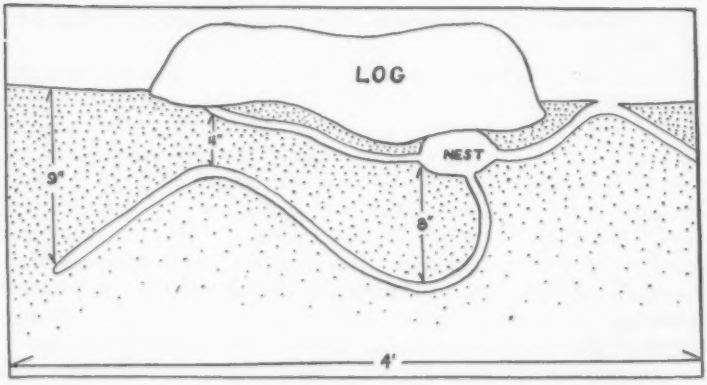
On two occasions I have found the breeding nest and many times the smaller resting nest. On May 1, 1927, I found the large breeding nest of this species under a rotten log in a well wooded tract of low ground (plate 10). When the log was removed and the nest exposed, the female immediately ran from it. The nest was covered over, the entrance being on the side. Two runways led from the nest, in opposite directions, while a third went directly down below it. This nest was composed of entire dead elm leaves. It measured 8 inches across the top; the depth was $5\frac{3}{4}$ inches. The inner diameter of the nest was 2 inches across and the depth $2\frac{3}{4}$ inches. The inside was not seen when the log was lifted, the top of the nest being covered over by a thin roof of leaves. The lining was composed of the same material as that of the outside. A large dung pile was located within four inches of the nest. A small number of *Polygyra* shells, all long since cleaned of their occupants, were lying in the adjoining runways, but there was no evidence of other food in the vicinity.

There were seven young in the nest, approximately nine days old.

These I put in a large glass jar and placed this next to the nest. The mother appeared, first from an opening in the nest, then from a burrow



TEXT FIG. 1. NEST OF BLARINA BREVICAUDA, WITH ADJOINING RUNWAYS. ITHACA, NEW YORK. APRIL 10, 1927



TEXT FIG. 2. NEST OF BLARINA BREVICAUDA, WITH ADJOINING RUNWAYS. ITHACA, NEW YORK. MAY 1, 1927. CONTAINED SEVEN YOUNG

and kept running about the now exposed runways for several minutes. Finally she entered the jar, grabbed one of the young by the belly, and

made off with it so fast I could not trap her. The young one must have been carried some distance, because subsequent search failed to reveal it either in the nest or the closely associated burrows. The mother was gone forty seconds, and when she next entered the jar for the young, I succeeded in trapping her.

Another nest, which I suppose was ready for the acceptance of young, was uncovered on April 10, 1927. This was situated under a partly buried log (text fig. 1). The nest was fifteen inches below the level of the ground. This chamber was composed primarily of unshredded maple leaves, which made up 80 per cent of the nest. The nest was 7½ inches long and 6¼ inches wide, with an inside diameter of 2¼ inches. The previous day I had taken a gravid female with seven embryos of about half-time development from a runway leading directly to this nest. No evidence of any food was found near the nest.

A number of resting nests were uncovered when burrows were excavated. These nests were generally the size of a large apple. The material composing the nest depended in large measure on that which was most available. There seems to be little if any choice in the material used. Most frequently I found the nests to be composed of the entire dead leaves of elm, maple or willow, less often sedges and the leaves of herbaceous plants.

No nests were found composed of mouse hair, as Shull describes, nor were any dead mice found close-by, but snail shells were often present in the tunnels and burrows.

SANITATION

The scats were usually in evidence, but never as prominent as those of *Microtus*. About the nest, the scats are piled to one side of the runway. In captive specimens, the shrews without young often dropped their excrement in the water or about the sphagnum, but never in the nest box. One which had a litter rarely ventured from the nest box to deposit her feces, but dropped them in the corner of the box, much after the manner carried on in the wild state.

SEASON OF REPRODUCTION

Very little definite information is available on this topic. Such a keen observer as Rhoads sets down this statement: "The young are born at all seasons of the year, though less frequently in winter." This could not have been based on actual observation. It is possible that

Rhoads, without hesitation, grouped it with *Microtus* in this respect, as young field mice are to be found every month in the year.

About Ithaca, New York, sexual activity commenced about the first week in February. Few males were to be found with enlarged testes previous to this. Males taken in late February and early March had testes measuring 8 to 9 mm. in length. The normal length of the testes when observed at times other than the breeding season was 2 to 3 mm. in length. The testes continued to enlarge and in early April had reached their maximum development. They then measured 9.5 mm. and the two averaged .44 gms., or about one-fiftieth of the shrew's total weight.

A female taken April 9 contained six embryos, three in each horn of the uterus, that measured 2 mm. each. On April 22 a female was taken that was nursing and an examination of the uterus indicated she had given birth to the young only a short time previously.

On April 27, a female with eight embryos was collected. Four in each horn of the uterus measured 16 mm. from crown to rump. These were of approximately two-thirds time.

On May 1, seven embryos, four in the left horn and three in the right horn of the uterus, were taken from a trapped female. These measured 18 mm. from crown to rump. Another female, collected the same day, contained eight embryos, four in each horn of the uterus, and which measured 5.5 mm. from crown to rump. On the same day an overturned log exposed a nest of seven young, approximately nine days old.

On May 13, a nursing shrew was collected. Two more nursing shrews were taken on May 28 and June 3.

These observations would indicate that the first young are born about the middle of April and the last litter of spring young are dropped the latter part of May. These dates are for Ithaca, New York. North and south of this locality the periods may vary.

I have collected no Ithaca specimens that indicated sexual activity during July and August. Dice, writing about the short-tailed shrew, says: "The uterus of a female taken July 10 showed a few small swellings which were identified in the field as embryos. No embryos were found in 26 other females taken between July 15 and September 4. In the latter part of the season fewer immature specimens were taken than earlier in the summer. These facts show that in this region the species breeds in the spring or early summer and does not usually breed again in July and August." This was in northern Michigan, about 5 degrees of latitude farther north than Ithaca.

On September 27 I took a female showing evidence of nursing. Two males taken the first of October had enlarged testes and were apparently in rut. Seton (1909) records a female taken in Connecticut on September 21 with five embryos of about half time.

From these observations I should say that two litters are produced annually in central New York, one in the spring and another in the late summer. A particularly vigorous female might produce three broods and this may even be the rule in states farther south.

PERMANENCE OF MATING

Rhoads states: "Of the domestic habits of the mole-shrew we know little, and that, in a general way, would seem to point to anything but conjugal felicity or fidelity, and their fraternal relations may safely be set down as far below par." My observations are not in accord with those of Rhoads. I believe there can be but little doubt that *Blarina* pairs, and if not for a life union, it is certain that they are found together in periods other than that of the breeding season. On six occasions I have caught a male and female in the same burrow on succeeding nights, and further trapping in the same place failed to reveal more. These instances were all in the late fall, when the shrews do not show sexual activity. Thus it would seem that a partnership exists regardless of the breeding season.

On April 17, 1927, I captured in a wire trap two shrews together which later proved to be male and female. They got along with each other very well. A large aquarium was their home for six hours, and during this time they never attempted to bite or hurt one another in any way. On April 28, 1927, I collected a rutting male in a shallow runway leading below a log, the runway terminating in a large nest. The previous night a pregnant female had been taken in the same trap. Furthermore, when a trap was placed in the site of a nest that had contained young, after they and the mother had been removed, no male was taken, although the trap was not removed for three days.

Thus it would appear that the male and female are together for a part of the breeding season. It is likely that he must leave the female, perhaps under pressure, as Seton thinks, when the young appear.

SECONDARY SEXUAL CHARACTERS

In all the Soricidae there is to be found a side gland (plate 12, fig. 10). This organ is on the side of the body, located nearer the front limb than

the hind limb, and is more ventral than dorsal. In the males, particularly during the breeding season, the organ is enlarged and plainly visible. In the female it occurs but is less noticeable. The area externally measures approximately 10 mm. in length and 3 to 4 mm. wide. Two rows of short stiff hairs are applied against one another, and are kept stained and greasy by a viscous excretion. In sexually active specimens the part is rendered more visible by an apparent bareness.

This gland has aroused considerable interest among Europeans. Sigurd Johnsen (1914) has made an elaborate study of this organ in the Old World Soricidae. This observer found a direct connection between the side gland and the sex organs. Johnsen showed that in the male shrews, parallel with the ripening of the testes goes the growth of the sweat glands, and the preparatory stages of secretion take place. In animals fully in heat almost all the sweat gland tubules are in secretion. This author regarded the sweat glands in this organ as the formation place of the specific odor material.

My observations, while not of a histological nature, concur in every respect with those of Johnsen. It is easily seen that the side glands in the male shrews are much larger and are better developed than are those of the females and immature individuals. Externally their development parallels that of the testes. The side glands begin to show more prominently in February, and become more pronounced as the season advances. By the first of April they have reached their maximum size.

A pair of shrews taken in April was brought into the laboratory and left for a few hours, then removed to the next floor. The odor of these animals was very pronounced and it caused people to remark about it two days after the shrews had been removed. When the male and female were together, the hair about this glandular area in the male was parted so as to make a bare-appearing patch, about the size of a small bean, on the side of the animal.

It is possible that the shrews rub their sides against the burrows and leave a scent in order to attract one another. A peculiar bare patch of thickened dermis in the mid-ventral line of the belly is found in both sexes, and this may likewise be found to play a part in sex life.

RIVALRY AMONG THE MALES

I have taken a number of males with healed scars that indicate a battle, possibly with one another over a prospective mate. A large male taken in February had the tail taken clean off at the base, and well

healed over. Two others were minus a toe, while several others had scars on the face, hind legs and tail.

The males must certainly have competition for their mates, for if my observations are general, the males far outrank the females in numbers. I have in mind the difficulty in determining sex among the insectivores, and a careful internal investigation is always necessary to determine whether the specimen is a male or a female. Even then one can not always be certain, and the large numbers of unsexed specimens to be found in museums show that the collector has real difficulties at times.

In 93 specimens whose sex was determined positively, 64 proved to be males, and 29 females. This would indicate slightly more than twice the number of males than females. In the American Museum of Natural History, the collection of shrews shows a greater number of males than females. This is likewise true in the collections of the Brooklyn Museum, and the Museum of Comparative Zoology at Cambridge. From observations made in the field and laboratory it would appear that the shrews of this species may be monogamous. The relative number of males to females, if correct, might indicate polyandry, but this appears doubtful.

On one occasion I introduced a male into an aquarium with a female whose young three weeks previously had died when half-grown. The male cautiously approached the female, which rushed at him, chattering vehemently. He made off rapidly to a corner of the inclosure, throwing himself on his back, striking the air rapidly with his feet, all the while uttering his shrill chatter (plate 12, fig. 9). The male repeatedly sought out the female, but appeared afraid of her. She would have nothing to do with him. After they were together an hour, I removed the male, fearing injury to him.

GESTATION

Nothing seems to be known regarding the gestation period in the soricids, and I can contribute a few facts only.

On April 17, 1927, at 6 a.m. I took from a wire trap a pair of short-tailed shrews, both alive and in good condition. These were kept together until noon, and then separated. Hoping they had mated at this time or previously, I watched the female closely and made a daily examination of the nest she constructed. During the night of May 7–8 she gave birth to six young. They were born between 4 p.m., May 7, and 8 a.m., May 8. This would make the period of gestation 21 days

or longer. From observations of the period of sexual activity made on trapped specimens, and the appearance of the first young, it seems unlikely that the period would extend longer than a month.

DESCRIPTION OF YOUNG

The following notes were obtained from young that were born by a captive short-tailed shrew:

A few hours after birth the young were dark pink all over, wrinkled, and about the size of a large honey bee. The mother showed great solicitude during this period, and rarely left the nest, coming forth only to eat and drink. All the food placed in the aquarium was carried inside the nest chamber.

Thirty-six to forty-six hours. One was removed from the box, photographed, and preserved in alcohol (plate 11, fig. 3). It weighed 1.34 grams. The measurements were: Total length, 31 mm.; tail, 4 mm.; hind foot, 4.5 mm. The young were light pink all over, no hair except nine minute vibrissae on either side of the nose, the longest measuring 1 mm. The remnant of the umbilical cord was still present, although dried and brownish. This measured 2.5 mm. A red spot, similar in appearance to a blood clot, lay over the nasals. The eyes appeared as two small grayish areas, apparently buried beneath the skin for some distance. No eye-slit was visible. The external ear appeared as a small swelling.

Four days. The average weight of five was 3.8 grams. The average total length was 48 mm. The remains of the umbilical cord had entirely disappeared. All the upper parts were lead-colored, fading into pale pink on the belly. No hair was visible yet. The vibrissae measured 2.5 mm.

Five days. The side glands were very prominent, appearing as small dark red streaks on either side of the animal. No hair yet.

Eight days. All five young were removed from the nest to be examined (plate 11, figs. 4 and 5). The average weight was 6.2 grams. The average measurements of four were: Total length, 61 mm.; tail, 9.5 mm.; hind foot, 9 mm. Short hair had appeared all over the body, except for the median ventral line on the belly, which remains bare throughout life. The hair on the back was longest, measuring 0.9 mm. The vibrissae were 4 mm. long. The hairs concealing the side glands were hoary and had the appearance of being sticky. Teeth had not made their appearance, but the large upper incisors might be seen

beneath the gums. The little shrews could crawl about quite vigorously now, but were unable to lift themselves. The only sound was a low sucking note.

Ten days. (Fig. 6.) The average weight was 7.2 grams. Total length was 68 mm. The entire young were now covered with hair, although it was much lighter and somewhat shorter on the ventral side. The side glands were becoming less prominent, but continued to stand out as a whitish line. The young constantly gave a weak squeaky cry. They were covered with small mites of the genus *Parasitus*.

Thirteen days. (Plate 12, fig. 7.) The average weight of four young was 9 grams. The average total length was 73 mm. The sexes could now be determined by the presence of mammae in the females. The animals were well furred. The external ear was open. The side glands were obscure, but the mid-ventral bare patch stood out very prominently.

Fourteen days. Killed a young one to make a closer study. The measurements were: Total length, 73 mm.; tail, 12 mm.; hind foot, 16 mm. The two males were heavier than the females, averaging 1.4 grams more. The teeth had not pushed through the gums yet.

Fifteen days. One young was crawling about outside the nest box, and another was pushing through the top of the nest. They were replaced in the nest and four hours later were out again. A second time they were replaced and again they came forth.

Seventeen days. Two were remaining, the third found dead under the nest where it had crawled and become entangled in the grass. The average weight of the two live ones was 9.6 grams. The average total length was 85 mm.

Eighteen days. Both young were crawling about outside nest.

Nineteen days. One young remained alive. The other was found wedged in the bottom of the tin nest-box between the floor and the nest. No signs of violence were on it to indicate that the mother had killed it. The remaining young measured 91 mm. in length, and weighed 9.9 grams. The upper incisors had appeared through the gums and were slightly brownish.

Twenty-second day. The remaining young had died this morning, possibly through lack of sufficient food. It had been able to crawl about the aquarium very well. The teeth were well developed, the chestnut tips having been decidedly in evidence. The eyes were not yet opened. It seems likely that the young was weaned at this age.

NUMBER OF YOUNG

Of twenty-nine females with embryos or young which I have examined, the average number appears to be six or seven. The greatest number of embryos found in *Blarina* was ten, but this I believe to be exceptional. The smallest number observed has been five. As there are three pairs of inguinal teats, six or seven young would appear to be the normal number.

LITERATURE CITED

DICE, L. R., AND H. H. SHERMAN. 1922. Notes on the Mammals of Gogebic and Ontonagon Co., Michigan. Occas. Papers Mus. Zool., Univ. Michigan, no. 109.

JOHNSEN, SIGURD. 1914. Über die Seitendrüsen der Soriciden. Vorl. Mitt. Anat. Anzeiger (Jena), vol. 46, no. 12.

RHOADS, S. N. 1903. The Mammals of Pennsylvania and New Jersey. Philadelphia. Privately published.

ROWLEY, JOHN. 1902. The Mammals of Westchester County, New York. Abstract Linnean Soc. New York, no. 13, pp. 56.

SETON, E. T. 1909. Life Histories of Northern Animals, vol. 2, pp. 1116–1135. Charles Scribner's Sons.

SHULL, A. FRANKLIN. 1907. Habits of the Short-tailed Shrew. Amer. Nat., pp. 495–522.

Cornell University, Ithaca, New York.

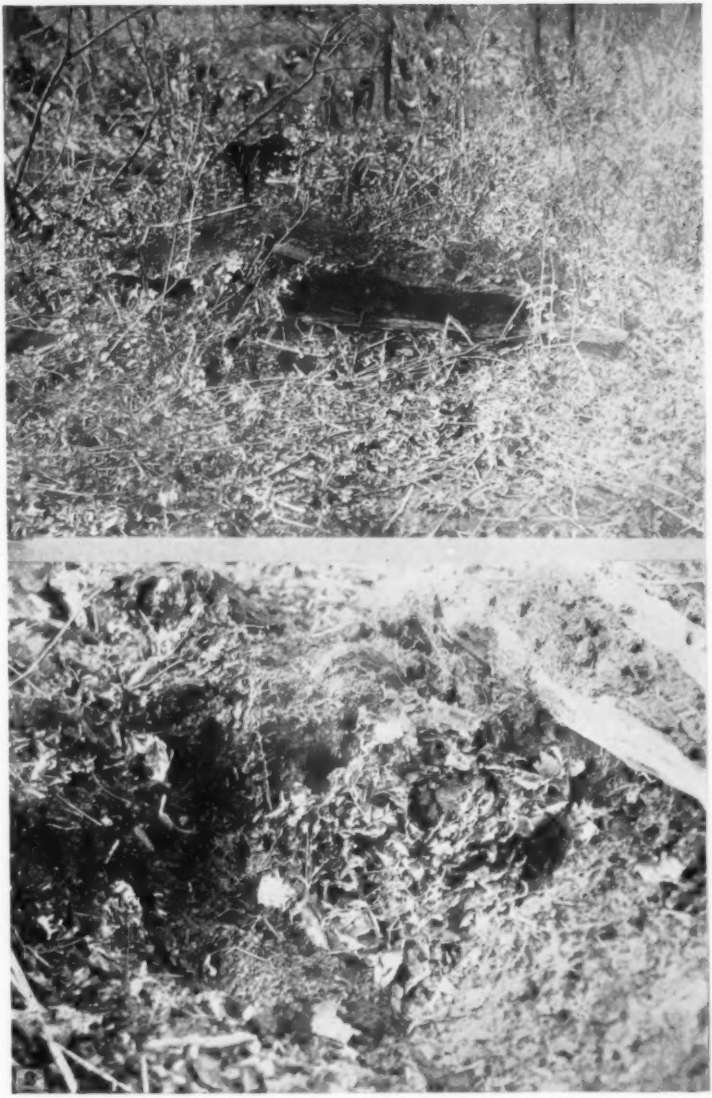


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FIG. 1. LOG UNDER WHICH BLARINA NEST WAS FOUND. ITHACA, NEW YORK. MAY 1, 1927.

FIG. 2. NEST OF BLARINA THAT CONTAINED SEVEN YOUNG. LOG HAS BEEN REMOVED TO EXPOSE THE NEST. ITHACA, NEW YORK. MAY 1, 1927.

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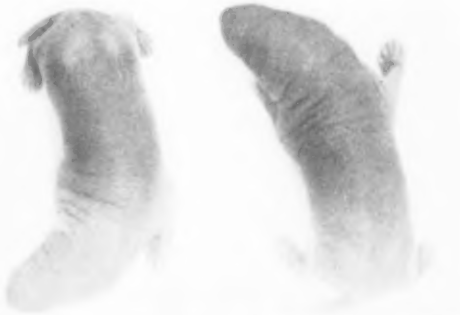

FIG. 3. BLARINA THIRTY-SIX TO FORTY-SIX HOURS OLD. NOTE THE REMAINS OF THE UMBILICAL CORD. FRESHLY KILLED SPECIMEN. $2\frac{1}{2}\times$. FIG. 4. EIGHT-DAY-OLD BLARINA. THE SIDE GLAND APPEARS FAINTLY. FROM FRESHLY KILLED SPECIMEN. $1\frac{2}{3}\times$. FIG. 5. DORSAL VIEW OF YOUNG BLARINA AT EIGHT DAYS. NATURAL SIZE. FIG. 6. YOUNG BLARINA NINE OR TEN DAYS OLD. NOTE THE APPEARANCE OF THE EXTERNAL EAR AND THE COVERING OF FINE HAIR. $\frac{2}{3}\times$

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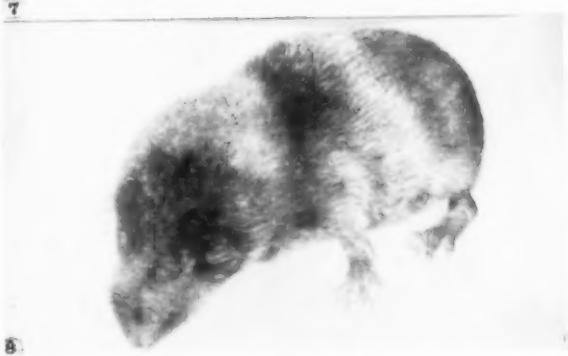

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FIG. 7. VENTRAL VIEW OF THIRTEEN-DAY-OLD BLARINA, SHOWING MAMMAE. THE SEXES MAY BE DETERMINED AT THIS AGE. $1\frac{3}{4}\times$. FIG. 8. TWENTY-DAY-OLD BLARINA. THE SHREW IS NOW ABLE TO FEED OF ITS OWN ACCORD AND CAN WALK SLOWLY. $1\frac{3}{4}\times$. FIG. 9. BLARINA IN DEFENSIVE ATTITUDE. THIS POSITION IS ASSUMED WHEN THE ANIMAL IS ATTACKED OR FRIGHTENED. THE FEET PAW WILDLY IN THE AIR, THE MOUTH IS OPENED WIDELY AND A CHATTERING NOTE GIVEN. $\frac{3}{4}\times$. FIG. 10. ADULT BLARINA WITH HAIRS PARTED TO SHOW POSITION OF THE SIDE GLAND. THE SPECIMEN IS A FRESHLY KILLED MALE, TAKEN JANUARY 2, 1928. THE GLANDULAR AREA IS NOT VERY PRONOUNCED AT THIS SEASON. $\frac{3}{4}\times$.

PRONGHORN ANTELOPE

By George Bird Grinnell

The former eastern limits of the antelope's range are uncertain. Herrick in his "Mammals of Minnesota" gives the species as formerly occurring within the limits of that state, but mentions no details. Alexander Henry, the younger, in his journal (New Light on the History of the Greater Northwest) speaks of a "cabri" brought into the fort at the mouth of the Pembina River which had four inches of fat on its haunch. Cabri is the old name for antelope, but the detail of its fatness makes it seem probable that this animal was a mule deer. Henry's mentions of small game animals are too vague to be depended on.

The records of the Biological Survey, shown me by Dr. T. S. Palmer, are more satisfactory. These make it appear that the antelope formerly occurred in southwestern Minnesota, in western Iowa, and possibly even in western Missouri, though the statements are general and there is some uncertainty as to the western boundaries of Missouri at the time the record was made.

A recent issue of the Minnesota Game Commission's Bulletin states that in 1885 L. M. Eriksrude saw an antelope near Tracy, in southwestern Minnesota, which he and other boys chased away. Mr. Eriksrude has confirmed this statement by a personal letter to me. This is the only definite record by an eye witness of antelope in Minnesota of which I have knowledge.

Antelope obviously can not exist in a thickly settled country and have disappeared from most of their eastern range. They existed long in eastern Nebraska, and on one occasion not very many years ago I saw a wild antelope a very few miles west of the town of Fremont, not more than forty miles west of Omaha. An Omaha newspaper item, December 28, 1921, tells of an antelope being seen southwest of Omaha, near Louisville, Nebraska.

The range of the species included the northern plains of the Saskatchewan, but as winter came on, most of the northern antelope moved south seeking a winter range where shelter could be found. I recall an occasion just after a terrific blizzard of cold and snow in northern Montana, when the bottom of Milk River east of the present town of Havre was full of antelope, which were slaughtered in great numbers by whites and Cree Indians. To the south, the antelope extended well into Mexico, and to the west, to the Pacific coast.

I have more than once spoken of the very great numbers of antelope

found on the plains in early days, and have expressed the belief that they were more abundant than the buffalo. With this statement most old-time prairie men agree. Yet, except in winter when they gathered in herds of thousands, the antelope were not conspicuous, since usually they were found in small groups from three or four to fifty or sixty, and when alarmed ran away in these small groups. The antelope were small, protectively colored, and scarcely noticeable a mile or two away except by their white rump patches, while the buffalo, large and black, were visible at a great distance and when alarmed fled in companies, gathering to themselves as they ran other herds, which at last formed a great black mass uncountable and sometimes astounding. The antelope when they fled did not gather up in herds and soon disappeared, but the buffalo were seen for a long distance.

In old times in summer one traveled day after day over the prairie with antelope constantly about him, not in great herds but in the little groups just spoken of. Except where they had been hunted, they were by no means shy, and their curiosity often led them to approach traveling parties. I have more than once seen half a dozen antelope gallop slowly by a dismounted troop of cavalry at a distance of seventy-five yards, and seen, as it seemed to me, every man of the troop fire five or ten shots at the antelope as they passed, and then the whole group apparently untouched gallop off out of sight.

It was in winter, when the antelope collected in immense herds, that their numbers became impressive to the casual observer, and of these great herds, seen for the most part only by the winter meat hunter, not much has been written.

An obvious cause for the extermination of the antelope as soon as white hunters entered its country was the fact that it inhabited the open plains where the hunter could see it from a long distance, and by care and patience could approach near enough to kill it. Yet by the early hunters the antelope was little hunted, for so long as there were buffalo, which were easily killed and furnished abundant meat and robes, people scarcely troubled themselves to shoot the smaller animals. The Indians, however, captured them wholesale by various methods that have not been described in detail.

Habits of the antelope which greatly contributed to its destruction were its seasonal migration from a summer to a winter range, and its gathering on its winter range in great herds from which large numbers were slaughtered by meat hunters.

The Indians, at the proper time of the year, stationed themselves

along the migration routes and killed the antelope as they passed. White hunters also took advantage of the habit, and I have no doubt that during these migrations the skin hunters destroyed vast numbers of antelope just as they destroyed vast numbers of buffalo, when the animals were striving to get to water.

The migration movement took place at the approach of cold weather, just about the close of the rutting season, beginning during the month of October. It was briefly mentioned under date of October 16, 1804, by Lewis and Clark, who always spoke of pronghorn antelopes as "goats." In the Original Journals under this entry of October 16, the writer says: "Saw great number of Goats on the Shore SS." "Soon after I discovered great numbers of Goats in the river and Indians on the shore on each side, as I approached or got nearer I discovered boys in the water Killing the goats with Sticks and halling them to shore, those on the banks shot them with arrows and as they approached the shore would turn them back. Of this Gangue of Goats I counted 58 of which they had killed on the shore. One of our hunters out with Cap. Lewis killed three Goats."

Again on October 17, it is said: "saw Buffalow, Elk, and Great numbers of Goats in large gangues." Later on that same day comes a paragraph saying, "Great numbers of Goats are flocking down to the S side of the river on their way to the Black Mountains where they winter. Those animals return in the Spring in the Same way & scatter in different directions." S is the abbreviation for starboard.

I have witnessed these migrations at different points on the Missouri River, south of Fort Berthold, North Dakota, where they crossed on the way to the Little Missouri River and the Black Hills, and again at different points in the bend of the North Platte River, north of the Laramie Plains. The migration routes over which the antelope shifted from summer to winter range, were as well determined as were the migration routes of the elk, or of the mule deer, and were well known to local hunters. One of the very earliest photographers of game animals, A. G. Wallihan, took advantage of his knowledge of a certain migration path of the mule deer, set up his camera at a convenient spot, and photographed the animals as they came along.

When the antelope reached their wintering grounds, where there was some shelter from the cold, little snow, and abundant food, they gathered in herds often numbering many thousands; on the Laramie Plains and elsewhere, I have seen, I believe, more antelope together than I ever saw domestic sheep in one band. The winter meat hunter of forty years ago did not try to kill single antelope, but approached one of these

large herds until within range, and then from his heavy rifle dropped a succession of balls into the thick of the herd, continuing to shoot until the animals had passed out of range. Then the hunter went over the ground and collected the dead animals, of which there might be from six to a dozen. To those wounded by his random shots, he gave no thought.

In the early days of spring, while the weather was still cold and rainy, the antelope, which for six months had been absent from their summer range, began to appear again, and soon after this the young were born. From that time on, antelope were abundant through the summer.

One summer in North Park, Colorado, where antelope were perhaps as abundant as I have ever seen them, I found their trails, crossing the flats from one point to another, worn eight or ten inches deep in the hard soil—trails which reminded one of the buffalo trails worn in the soil of the plains by the buffalo going to and returning from water.

The rapid disappearance of the antelope is hardly appreciated by most people. It has vanished from a vast area of country where once it existed in astonishing numbers.

Most of the country is too thickly settled for them, but, in some places, sanguine people speak of them as "thousands." Efforts have been made recently in the state of Wyoming to authorize the issue of licenses to kill buck antelope, but this has not yet been done—thanks to the governor.

A year or two ago in western Nebraska, not very far from Scottsbluff, there were two small bands estimated as about forty in all. Recent reports indicate that these are growing fewer. There may be a very few in eastern Colorado.

On the border line between Oregon and Nevada, and generally in eastern Oregon and eastern Nevada, there are still a considerable number of antelope. Individuals who have traveled through the country declare that they are numbered by hundreds. These are reported as being frequently killed for bait by trappers and for meat by sheep herders. They must disappear, unless the people of Oregon insist on their protection.

A few years ago, on the Bell Ranch in New Mexico, there were thought to be perhaps two hundred antelope; but it is reported that this great piece of property is being divided and sold to homesteaders; and if this takes place, the antelope there must disappear.

In southern Arizona, southeastern California, and Mexico there are some antelope—in Mexico a good many. The form living there is slightly different from the one in the north.

All the states except Nevada and Washington protect the antelope by law; but in many places this law is lightly regarded.

There are still some scattered antelope on the wide plains of Alberta and Saskatchewan, Canada, and near Foremost, Alberta, the Dominion Branch of Public Parks has erected a long fence enclosing more than 5,000 acres of land, within which a few antelope live.

It has long been recognized that the pronghorn antelope is rapidly disappearing, but this danger to a unique species has recently been discovered and announced as new by people who have not been in touch with efforts already made to reduce the destruction. Men familiar with the western country and with the constant increase of its population have long known of the danger to the antelope. More than forty years ago—soon after the great movement westward began along the railroads—I pointed out that "with the advance of the settlements comes, in one district after another, the extinction of the antelope." Although none of us then recognized how swift this advance was to be, nor how completely it would sweep away the larger forms of wild life, it became increasingly evident year by year that the antelope must soon make room for the farmer.

The most obvious plan to postpone the threatened extermination seemed to be to establish herds of antelope in different fenced reservations, where the animals might be protected from attacks by man, and where their feeding range should not be turned into crop fields. A dozen or fifteen years ago the Boone and Crockett Club captured a number of antelope in the Yellowstone Park and sent eleven to the Wichita Game Preserve in Oklahoma, and eleven to the Bison Range near Ravalli, Montana. Somewhat later, with the permission of the Canadian authorities, the Boone and Crockett Club had thirteen young antelope captured in Canada, reared, kept there until they were able to look out for themselves, and then sent to the Wind Cave National Park. Still later it caused thirteen more to be sent there. Thus in the course of a few years it distributed antelope on three large fenced reservations.

The antelope sent to the Wichita Game Preserve died from various causes in the course of a short time. Some of those sent to the Bison Range died, supposedly from injuries in capture, but others lived and after a few years began to breed, with the result that a few years ago there were more than sixty antelope, all in good condition, on the Bison Range in Montana. Not very long after they were planted in the Wind Cave National Park the first lot sent there was reduced in number by

the attacks of coyotes, but the second lot did better and a few years ago there were, as I recall it, thirty-four antelope there. Now there are twenty-eight.

Some years ago, a series of severe storms drifted the snow so high about the Bison Range that coyotes and Indian dogs were able to walk over the fence, and it is understood that practically all the antelope on that range were thus destroyed. The same year, or the next one, coyotes and bobcats killed a number of those in the Wind Cave National Park.

The experience of the Boone and Crockett Club, which has planted about fifty antelope in three fenced reserves where conditions seemed very favorable, appears to indicate that it is doubtful if the antelope can be saved by stocking fenced areas. Quite recently the American Bison Society sent ten antelope to Wichita Game Preserve and the reports seem to show that this last planting has been no more successful than those made thirteen or fourteen years ago.

The state of Nevada has set aside a number of game refuges some of which have been formally called antelope refuges. The very arid country where Nevada and Oregon come together is a natural range for the antelope where, with protection, they will long exist. In northern California there is a considerable group. There are not a few in southern Montana, and their condition, so far as we can gather, seems to show that if they are left free and are protected against hunting, they will do well, though it may be doubted if they will greatly increase in numbers. It ought to be possible, I think, to create among persons who occupy natural stock range for antelope a sentiment which would result in their protection. Fortunately we have an example of what may be done in this direction by one who is interested and who possesses enough force of character to impress his neighbors.

In southern Montana in the country between Tongue and Powder Rivers lives a ranchman who for more than twenty-five years has himself been protecting the antelope, and by his precept and example has induced his neighbors to do the same thing. At one time some years ago he was obliged to speak very sharply to some of the neighboring Indians before he could persuade them to let the antelope alone, but within the past dozen years he has not known of the killing of a single one, though, perhaps ten years ago, he heard a rumor that a crippled antelope had been seen.

This man, Baxter Pierce, is a lover of wild things. Every winter he has about his house a flock of sharp-tailed grouse, which are about as

tame as chickens. Not long ago, when kind-hearted but ill-informed people objected to the distribution of poisoned grain for the purpose of killing gophers and prairie dogs, because they supposed that eating this grain would kill the grouse and other birds, Mr. Pierce captured four sharp-tailed grouse and sent them to the Montana game warden for experimentation. He told me that the game warden fed these birds for a week on poisoned grain and that none of them showed any effects of the poison. Similar experiments have been tried in New York state with pheasants.

Mr. Pierce's antelope are seen close about his house and in the nearby fields. They spend much of their time in his alfalfa fields, and he declares somewhat ruefully that he might as well keep a flock of sheep in the alfalfa, so far as cutting crops of hay goes. His neighbors make fun of him because he not only protects the antelope but also pays their board by supplying them with his own crops. He states his belief that within a radius of six miles from his ranch there are from 150 to 200 antelope.

I went out to see Mr. Pierce not long ago and on the way to the house drove up within thirty or forty yards of an old doe and some young antelope, which then rose from where they had been lying in the alfalfa and walked away. After we had left the house we drove within fifty or sixty yards of another group of females and young in charge of an old buck, and a little bit later saw a lot with a buck, only a little farther off. None of the antelope seemed shy, and only walked or slowly trotted away when we had come quite close to them.

If the people of this and similar neighborhoods where antelope now exist could be persuaded to let them alone, so that they might live their lives undisturbed, we might hope again to find regions where antelope could be seen at any time. The recent legislation in Nevada and, perhaps, in other states, seems to suggest that action of this kind may be hoped for after a while, but there is great danger in delay, and much educational work must be done before we can hope to accomplish anything toward perpetuating the antelope. The stocking of fenced areas appears to have proved unsatisfactory. Whether the stocking of a plateau in the Grand Canyon of the Colorado, as has already been done, will accomplish anything seems uncertain. We know that deer, elk and bison greatly increase under fence, but the antelope is built on different lines, and it is a question whether we can do anything to preserve that species except to leave it alone to work out its own salvation.

238 East Fifteenth Street, New York City.

CAMERA TRAPPING IN THE SNOW

By Tappan Gregory

[*Plates 13–14*]

I never appreciated the difficulties of trap-camera photography in the season of heavy snowfalls until I had the opportunity of trying it for myself for the first time in November, 1927. My first glimpse of the north country showed me a landscape covered with snow under a leaden sky, but with a rising temperature, which at 40°F. did much to clear the ground by evening. I was again in Marquette County, Michigan, near the shore of Lake Superior, and lost no time in looking over the possibilities for a set, necessarily close at hand that first day, as darkness was not far off when I set out with a camera trap on my back. Here and there a fox had crossed the trail that I was following and in some places had preceded me along it. My first objective was the sand beach on Pine Lake, but this time the shore, which had so often in the past recorded the tracks of a busy mink, was barren, save for the marks of beaver in several places. The old beaver house there was evidently occupied again. I had brought with me the head of a sizable lake trout and finally concluded to make my set for mink, though the chance of success looked slim. The calm of the lake and the stillness of the woods, broken only by the hoarse croaking of several ravens from the far shore, seemed quite in keeping with the season and the pursuit of pictures of the small, shy inhabitants of the forests.

The next day, November 11, the temperature stood at 45°F. when I started out to set another camera and to visit the trap on the beach. The fresh fox tracks which had attracted my attention on the tenth and the fact that the snow was rapidly disappearing from the ground persuaded me to place the second camera trained on the trail I had been following. It was a trail used frequently by many people in the summer, winding in and out over sandy ground among the jack pines. The bait was a piece of raw meat buried just deep enough to be completely covered with loose earth, on top of which was placed a bit of moss sprinkled with a few drops of scent bait obtained the day before from a friendly state trapper. As I circled around past the beaches on Pine Lake the sun showed dimly for a few seconds, but the low, fast-scudding clouds which blanketed the hilltops soon prevailed. No visible snow remained where the day before it had whitened the hillsides. My first trap was sprung all right, but by a red squirrel in mid-air, blurred by the speed of its flight. Red squirrels were very plentiful. I saw them and

heard their chattering every day, and their tracks in the snow were abundant during the whole of my stay in the woods. As might be expected, all were in winter pelage, lacking the familiar black stripe of summer time.

The elements were destined to make work on the beach so difficult that it was shortly abandoned. Rain started soon after eleven in the morning, with distant thunder, and continued with varying intensity well into the evening, accompanied by an ever increasing west wind and falling temperature. I left the first set when the rain came, thinking to reset late in the afternoon, but by that time the wind was driving the water right over my trip and bait, and I foolishly thought that it might be worth while to leave the apparatus where it was until the next day. But when I stepped out on the morning of the twelfth, I found the ground covered with snow, and snow in the air, whirling before the driving west wind, and the temperature down to 22°F. My route took me, of course, past the fox set, to find it untouched, and on beyond to another lake, where the beavers had built themselves a new dam, quite some little distance from the shore, and unusually high above the lake. A very small stream was backed up here and the pond itself spread out in an area quite thickly covered with green timber. Before I had reached the level of the pond, I passed a big old porcupine, huddled up on a branch near the top of a tall bare tree, well exposed to the driving snow and swaying in the wind. Its choice of location for a nap looked to me as though it left much to be desired. Perhaps it did not dare let itself lose consciousness in any situation more accessible to its natural enemies. Just at the point where the little stream pitched clear of the lowest beaver work, a mink hopped across and slid under the bank, almost at my feet. It seemed incredible that it could hide in such scant shelter. It looked very dark in color, almost black. As I glanced back after moving off, a swirl of water attracted my attention and I returned a few steps to watch the mink working on down stream,—in and out of the water, jumping and scurrying along without a backward glance. Later in the week I caught a glimpse of another dark-coated one hunting along the icy edge of Pine Lake.

Returning by a circuitous route, I was afforded a glimpse of a red-backed mouse as I passed along. It spent some time sitting in a hole, with only head and shoulders visible above the snow, studying me with its bright little eye, then scuttled on about its affairs, reminiscent of a tiny snowplow, as it scooted along.

When I came again to the camera on the beach, I discovered the lens

covered with snow, and the whole front of the box crowded with it. Several feet of the wire connecting battery with trip were awash and came up out of the sand free, leaving the trip completely buried on the beach under the waves, irretrievably lost. The shutter showed a tendency to slip, but fortunately needed only warming up to be in order again, and the battery was sound. It took me so much time to clean up the apparatus that the making of another set had to be deferred until the next day. I used the remaining portion of the daylight hours in scouting around through the jack pines, finding little of interest. I suppose that there were not many mammals moving about during the snowstorm and the tracks of any which might have passed my way ahead of me had been obliterated. I did jump one doe and took delight, as usual, in watching her bound off, stop to turn and look, and continue on her way only when I was again in motion. Then a fine buck of about eight points started up close to me, worked around in a semicircle to get down wind, caught a glimpse of motion as I stooped for a better view, wheeled in his tracks and was away. He stood only about twenty yards from me.

The diminishing wind and the clearing sky that evening led me to hope for fair weather, but an occasional glimpse of watery sunlight was all that was vouchsafed on the thirteenth, with a strong south wind sending the temperature up close to 40°F. Exploring that morning for a new place for my No. 1 camera, I came upon what I took for the tracks of a fox hunting mice, and there, at the foot of a dead stump, I lightly buried raw meat once more and added scent bait. I made a deal of a muss, of course, working in the snow, especially in burying the wire cable in the frost encrusted ground, but I thought that if the high temperature lasted, the snow would soon be gone and the general situation improved accordingly. This cable that I speak of had to be long enough to connect up the trip with the battery. The battery was customarily placed right behind the camera so that the fuse wires leading from the flash need not be too long and the trip, consisting of two small copper wires, to one of which the bait was wired, was, of course, set up some little distance off. In this case, in order to be sure to have plenty of room on the plate for a fox or a coyote, I set up the camera just over twelve feet from the bait. Had I known that no fox would return to this delightful spot and could I have counted in advance on mice and squirrels, I should have set the camera much closer.

On my rounds that afternoon, I found that the beavers were still cutting and had put considerable mud on their house, and I heard one of

them inside the house, whining. After I had been out an hour or so, some sound caught my ear which made me think the trap by the stump had been sprung, but in this I was mistaken. Before I had been on my way again five minutes, however, it did go off, shortly after 3:30 in the afternoon. A red squirrel had tripped it and it looks very much in the picture as though it were actually interested in my bait. The trip was really too delicate, the finer wire of the two being thirty gauge soft copper and the heavier not much larger. The result was that this trap was sprung several times without my being able to find from the negative what had done it. Near the camera I came across a couple of pyramids of pine cones constructed, I suppose, by squirrels. They were soon buried under the snow and my opportunity for observation lost.

There was a distinct threat of winter in the air on the morning of the fourteenth. The wind had veered into the northeast and the sky was dark, although the temperature was still up just under 40°F. when I started out. A partridge flushed ahead of me as I followed an old road around the south shore of Pine Lake. It looked as though the poor thing was trying to take a dust bath on the damp road. Snow commenced in the middle of the morning and continued off and on for a week or more. Passing the Pine Lake beaver house on the way home, I could detect no further definite signs of mud plastering, but there were some fresh cuttings. By this time the temperature was going down and Lake Superior was roaring in with its picturesque breakers.

All day of the fifteenth the blizzard continued with full force, burying both of my traps in nine or ten inches of snow, and making it useless for me to attempt to dig them out and put them in operation again. The cameras themselves were fairly well protected, but the bait, of course, was too far under the snow and the trip wire itself was so completely covered up that there was little or no possibility of anything getting at it. It was several days before the snow let up enough to make it worth while to dig out the traps.

During the interval, I had the pleasure and privilege of accompanying H. K. Tenney while he hunted deer. He is a great woodsman, and I think as accomplished a still hunter as a man could be. I crossed Pine Lake with him on the seventeenth, and while he followed a beautiful ten point buck which we had seen coming down the slope ahead of us, I occupied myself setting a third camera on a well traveled deer run, already distinctly marked and beaten down in the snow. While I was busy at this, I heard the shots that killed Mr. Tenney's buck. About an hour later, from a distant point by a nearby stream, the sound of the

flash reached me. Returning for the buck, Mr. Tenney and I stopped above a picturesque valley and sat on a great fallen tree to eat our sandwiches. Shortly a young buck with fine antlers came into the valley and crossed to the ridge near us, nosing along unconcerned until a drift of air gave us away. He stopped to gaze over his shoulder in our direction before speeding on, but I doubt if he could make us out. On the far side of the valley a doe and fawn made their way and disappeared unconscious of our presence. It is not unlikely that they were the ones which set off the trap. The balance of the afternoon was occupied in bringing the buck back to headquarters, and daylight had just about faded out by the time we reached the north shore of Pine Lake. Crossing the last stretch of ground through the snow, I had just a glimpse of a little shrew-like fur-bearer hurrying somewhere, but it was too dark to attempt to classify it.

Although there was still snow in the air the next day, the heavy fall was over and the temperature remained well below freezing. This gave me the chance I had been looking for, to put again in working order the two traps among the jack pines. It was worth while now to remove the snow from trip and bait in each case. Before doing this, however, I set once more the camera on the deer run, resulting in another deer picture taken that night. I was not spending much time or effort on deer, and after one more experiment on the runway, when the trap was sprung by snow sliding from the branches of the trees in the rising temperature, I packed up the apparatus and left the pack for a short time standing in the old lumber road, close to the favorite crossing of the deer. While standing nearby, we saw a doe approach the road unmindful of our fresh tracks. She scrutinized us for many minutes as we stood motionless, but having once satisfied herself that our presence was of no importance, she gave us scant attention thereafter, although it must have been a matter of ten or fifteen minutes before she mustered sufficient courage to pass that villainous looking pack,—starting, crouching, whirling and bounding away at first sight of it, circling and exercising every trick of caution in her subsequent wary approach, which finally carried her to safety in the heavy timber.

Coming through the pines to the shore of Lake Superior, after digging out my snow-bound traps, I was treated to the inspiring sight of a magnificant eagle high in the air, floating in the strong northwest wind, with hardly a move of its broad pinions, letting itself ride at length on the wings of the gale, and sailing out of sight down the shore with incredible speed.

For two or three hours on the nineteenth, the sun shone brightly, but by afternoon the clouds had again taken command and intermittent snow flurries were driving before a strong, fitful southeast wind. In the afternoon I found the trap by the stump sprung and the tracks of a weasel passing quite close to the bait. I could not trace them right to the trip wire, but they must have been there as the subject of the resulting picture was a weasel. Unfortunately its head is down, but whether it was in search of mice, or passing by, or actually interested in the old meat bait sprinkled with scent, I am unable to tell.

The fox set on the trail still brought no results, although a doe had narrowly missed the wire. She stopped and stamped, no doubt gazing at the camera, her foot coming down within an inch or so of the wire. Then circling, she approached to within two or three feet of the camera itself, stopped there facing it, moved around for a good, close examination of the flash lamp, swung back to the trail and proceeded on her way.

Near camp a trough had been placed in which to supply food for the deer during the winter, and here I saw a bit of interesting by-play. Two does approached. One walked directly to the trough and commenced eating, but drove off the second when she came near and made her keep her distance, disconsolate.

On the morning of the twentieth, we wakened to find thick, soft snow falling copiously, which did not let up until the middle of the afternoon. Coming in at dusk with W. P. Harris, Jr., who had arrived the day before, I found at last that a picture had been taken by the camera set for a fox on the trail. It was quite dark by the time we reached the set and the snow much too deep for comfortable travel, also making it difficult at first to know the condition of the trap, because the trip and connecting wire were entirely buried and there was a heap of snow on top of the flash lamp, and, of course, no fresh tracks visible. It was necessary to remove considerable snow before we discovered that the flash had gone off and that the wire was broken, indicating, as was the fact, that a deer had sprung the trap. I think that it pawed at the wire with its fore foot while sniffing my choice old bait of meat. Another illustration of the futility of hoping for the right sort of animal to come to the set at the right time.

It was the twenty-third before another picture was found recorded at one of the traps. This time one of a red-backed mouse by the stump. I expected to find the image of a squirrel on the plate because when I reached the trap that morning, the tracks of one led right across

the bait. The weather had been much milder, the temperature having risen above the freezing point on the twenty-first, and it stayed mild during the rest of the time until I left the woods. Discouraged by the lack of activity at the trail set, we moved this camera to a fox den among the jack pines, setting it with the trip wire across the mouth of the den, and transporting the poor old pork chop with some scent bait for use inside the den. Perhaps this was a bad move. There were numerous fox tracks around, though none looked as though they had been made that morning, but the den did have every appearance of continued, although irregular, use.

The beavers were still cutting on the shore of Pine Lake. I am sorry now that I did not use one camera to try to make a record of a member of this colony in the snow.

Thanksgiving Day, November 24, was the only day we had with the sun out and the sky quite clear. I found no signs of activity at either camera and brought in that morning the one that had been set by the stump. The mercury hovered around 40°F. and the brilliant coloring of the sunset gave promise of continued fair weather, but my schedule called for early departure back to the city the next day, so before sunup I was on my way to the fox den, enjoying the mildness of the temperature and the beauty of the light in the sky where the clouds caught the color from the sunrise, all around the horizon, deep and brilliant in the east. As I returned to the cabin, the first rays of the sun released from the clouds touched only the tops of the tallest Norways,—a very picturesque effect. The trap had been sprung, and the wire definitely sagged, but not broken. The pork chop had disappeared and there were fresh tracks in a couple of directions from the den, and a definite mark by the trip wire where some animal had turned suddenly. In the half light of early morning, and because of the light new snow on the crust, I failed to identify them positively as those of a skunk, which they proved to be. I had really forgotten that these few warm days might well enough bring one out from its winter quarters. From the fact that the flash was tripped when the skunk was on its way into the den, as shown by the picture, and that at the flash it had turned away and changed its course, and that when I arrived in the morning the chop had disappeared, I feel fairly safe in drawing the conclusion that after the animal had retired, startled by the explosion of the powder, it returned to dispose of the bait.

Chicago, Illinois.

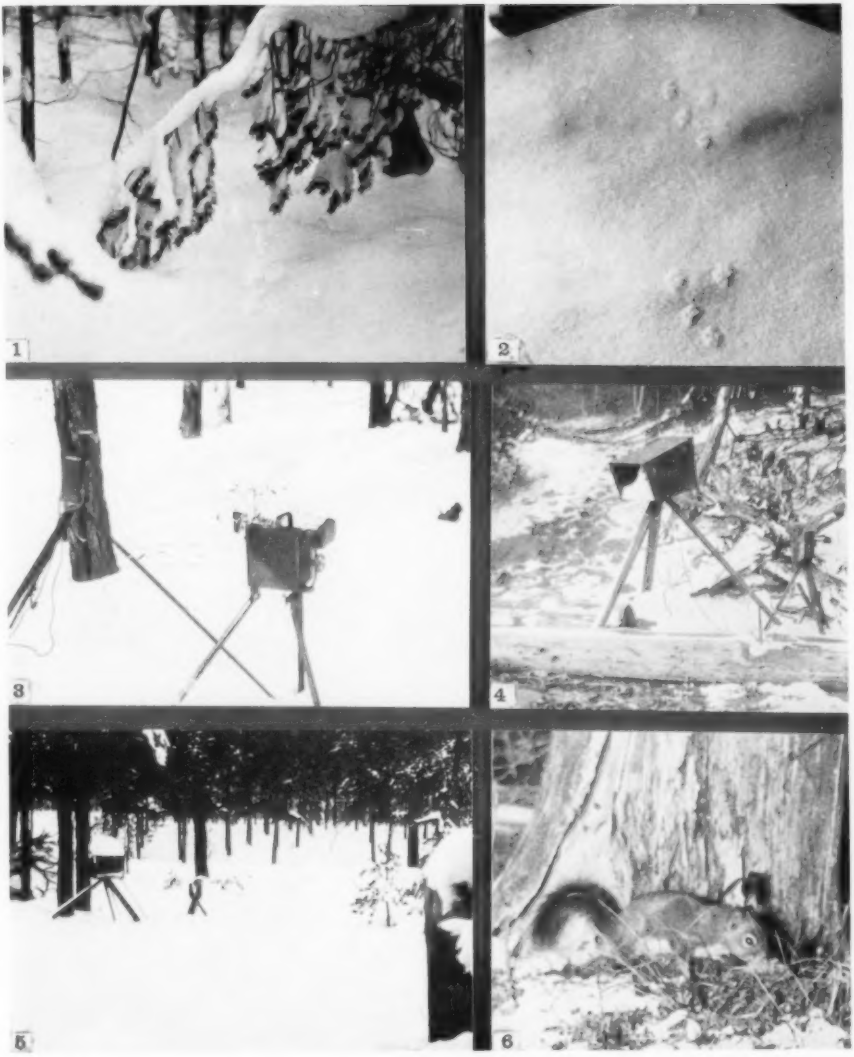

FIG. 1. THE TRAIL OF A FOX. FIG. 2. RED SQUIRREL TRACKS. FIG. 3. THE SET AT THE FOX DEN. FIG. 4. THE CAMERA OUT OF SERVICE. FIG. 5. WHERE SQUIRREL, MOUSE, AND WEASEL WERE FLASHED. FIG. 6. RED SQUIRREL. NOVEMBER 13, 1927.

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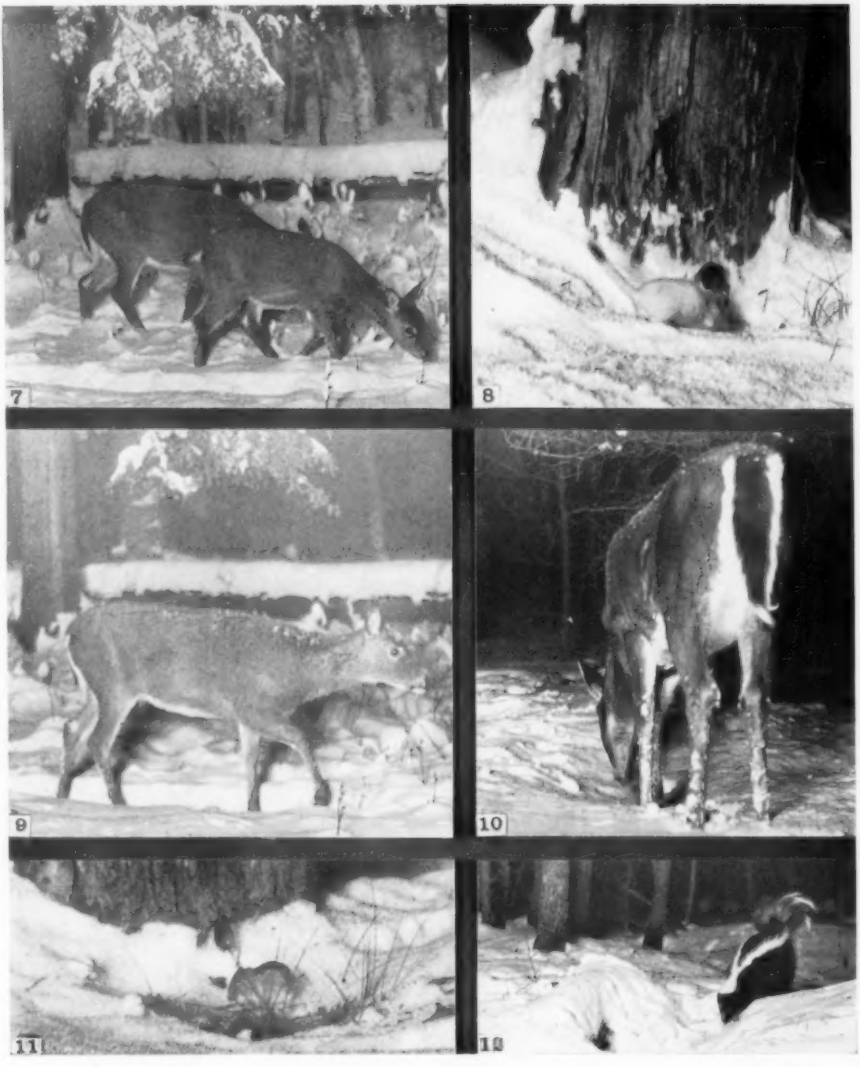

FIG. 7. DOE AND FAWN AT NOON. NOVEMBER 17, 1927. FIG. 8. A WEASEL IN WINTER COAT. NOVEMBER 18, 1927. FIG. 9. A NIGHT TRAVELER. NOVEMBER 18, 1927. FIG. 10. NOSING INTO THE FOX BAIT. NOVEMBER 19, 1927. FIG. 11. RED-BACKED MOUSE. NOVEMBER 22, 1927. FIG. 12. SKUNK AT FOX DEN. NOVEMBER 24, 1927.

UNIV. OF MICH.

WEIGHTS OF SOME NEW YORK MAMMALS

By W. J. Schoonmaker

It is widely believed that the members of a species or subspecies may vary considerably in weight and measurements in different parts of its range. In the case of game and fur-bearing animals, the belief is often based on the judgment of hunters and trappers rather than on definite studies. Only by building up considerable masses of data can we arrive at any understanding of this matter, and the following notes are presented in tabular form as a brief contribution to the subject. All localities are in the state of New York.

LOCALITY	DATE	SEX	TOTAL LENGTH	TAIL	FEE	WEIGHT	REMARKS
Black Bear (*Euarctos americanus americanus*)							
			mm.	*mm.*	*mm.*	*lbs. oz.*	
West Township, Albany Co.	10–18–1927	♂				375–0	Weight taken after being bled, not drawn
Johnsburg, Warren Co.	10–26–1927	♂				475–0	Weight after being drawn, 385 pounds
Raccoon (*Procyon lotor lotor*)							
Stamford, Delaware Co.	10–22–1925	♂	737	248	118	10–4	
De Freestville, Rensselaer Co.		?				9–0	A juvenile taken in spring, 1927, weighed alive Sept. 24, 1927
Fisher (*Martes pennanti pennanti*)							
Roger Mt., Essex Co.	4–2–1926	♂	1018	380	130	11–0	

LOCALITY	DATE	SEX	TOTAL LENGTH	TAIL	FEET	WEIGHT	REMARKS
Mink (*Mustela vison mink*)							
			mm.	*mm.*	*mm.*	*lbs. oz.*	
North Chatham, Columbia Co.	1-15-1928	♂	555	195	64	2-0	
Skunk (*Mephitis mephitis nigra*)							
Rensselaer, Rensselaer Co.	11-16-1927	♂	675	250	62	8-12	
	4-16-1927	♂	620	230	65	4-4	
Malden Bridge, Columbia Co.	4-19-1927	♂	592	240	64	3-2	
	4-22-1927	♀	603	230	64	5-9	
Little Falls, Herkimer Co.	9-30-1927	♂	641	280	67	4-11	
Red Fox (*Vulpes fulva*)							
Ephratah, Fulton Co.	5-16-1927	♂ juv.	699	248	127	3-8	
Couse, Rensselaer Co.	3-18-1928	♂ yg.	990	370	155	8-0	
Selkirk, Albany Co.	11-5-1927	♂				5-0	Large abscess on lower jaw
Gray Fox (*Urocyon cinereoargenteus cinereoargenteus*)							
Canajoharie, Montgomery Co.	10-23-1927	♂	986	360	145	10-8	
Albany Co.	10- ?-1927	♀	972	330	130	9-0	
Nassau, Rensselaer Co.	do	♂	943	304	130	9-8	
Slingerlands, Albany Co.	11- 6-1927	♂				9-0	
Wildcat (*Lynx rufus rufus*)							
West Stony Creek, Warren Co.	11- 1-1927	♂	955	175	180	31-11	
Gilboa, Schoharie Co.	12-14-1927	♀	934	165	180	26-8	
Berlin, Rensselaer Co.	12-18-1928	♂	890	165	165	20-0	
Arden, Orange Co.	2- 1-1928	♂	862	140	158	26-0	Kept in captivity nearly a year; unusually fat
	2-28-1928	♂	920	145	165	21-8	

LOCALITY	DATE	SEX	TOTAL LENGTH	TAIL	FEET	WEIGHT	REMARKS
Woodchuck (*Marmota monax rufescens*)							
			mm.	mm.	mm.	lbs. oz.	
Nassau, Rensselaer Co.	4-18-1927	♀	561	124	79	6-0	Four well-developed embryos
Malden Bridge, Columbia Co.	4-20-1927	♂	607	136	83	7-8	
De Freestville, Rensselaer Co.	7-23-1925	♀	635	152	89	10-0	
East Schodack, Rensselaer Co.	8- 2-1927	♂	635	152	83	9-0	
	do	♀	610	127	76	8-0	
	do	♀	610	127	76	8-0	
Stamford, Delaware Co.	9-18-1927	♂	552	121	89	5-8	
	do	♂	546	114	83	5-8	
	do	♂	540	140	83	5-4	
Fisher's Chipmunk (*Tamias striatus fisheri*)							
Heart Lake, Essex Co.	7-30-1926	♀	248	98	36	0-3.7	Six 17-mm. embryos
Allegany State Park, Cattaraugus Co.	9- 1-1926	♂	247	99	37	0-3.1	
Red Squirrel (*Sciurus hudsonicus loquax*)							
Heart Lake, Essex Co.	7-28-1926	♂	228	120	47	0-5.3	
Gray Squirrel (*Sciurus carolinensis leucotis*)							
Slingerlands, Albany Co.	10-23-1927	?	518	250	67	1-4	
Valatia, Columbia Co.	10-28-1927	♂	463	190	60	1-0	
Stamford, Delaware Co.	do	♀	510	231	70	1-9	
	do	♂	496	223	69	1-4½	
Nassau Lake, Rensselaer Co.	10-16-1927	♂	487	220	40	1-3	
East Nassau, Rensselaer Co.	11- 2-1927	♂	432	193	62	1-4	
Rensselaer, Rensselaer Co.	11-12-1927	♀	510	230	65	1-6	
Stamford, Delaware Co.	10- ?-1925	♀				1-8	Weighed by Dr. S. C. Bishop
	do	♂				1-3	do
	do	♂				1-6	do

LOCALITY	DATE	SEX	TOTAL LENGTH	TAIL	FEET	WEIGHT	REMARKS
Muskrat (*Ondatra zibethica zibethica*)							
			mm.	mm.	mm.	lbs. oz.	
De Freetsville, Rensselaer Co.	3-24-1927	♀	642	286	83	3-8	
	do	♂	597	260	86	2-10	
	do	♂	597	245	79	2-10	
	do	♂	540	242	79	1-10	
	do	♂	558	251	79	1-12	
Schuyler Brook, Albany Co.	10-22-1927	♂	541	251	83	1-14	
	do	♂	533	227	85	1-11	
Rensselaer, Rensselaer Co.	3-19-1927	♀				2-4	
	do	♂				2-6	
	do	♂				3-4	
	do	♂				2-2	
Porcupine (*Erethizon dorsatum dorsatum*)							
Floodwood, Franklin Co.	11-?-1927	♂				16-0	Albino
European Hare (*Lepus europaeus*)							
Rensselaer, Rensselaer Co.	12-5-1927	♂	648	76	159	8-4	

New York State Museum, Albany, New York.

MAMMALS OF SHERBURNE COUNTY, MINNESOTA

By Bernard Bailey

The following list of mammals is based mainly on collections and notes made at Elk River, Minnesota, by the author during the past fifteen years, on earlier collections by his uncle, Vernon Bailey, from 1880 to 1888, and his aunt, Anna Bailey Mills, from 1887 to 1891, and from observations of his father, Charles A. Bailey, from 1870 up to the present time. Some of the notes also date back to the time when his grandfather, Hiram Bailey, first came to the county in 1867, and his brother, Orlando Bailey, who settled here in 1851. Thanks are also due to Thaddeus Surber of St. Paul, Minnesota, for the note on the escape of the blue fox near here.

The village of Elk River, county seat of Sherburne County, is on the east bank of the Mississippi River near where it is joined by the small Elk River, and thirty miles northwest of Minneapolis. The original Bailey homestead around which most of these notes were gathered is about six miles northwest of Elk River in a half-timbered, half-meadow country lying between the big prairies west of the Mississippi and the original white pine forest country forty miles to the northeast. This was originally a half-open bur oak and jack oak country of sandy soil but with strips of clay soil and heavy timber and extensive tamarack swamps, numerous marshes, streams and small lakes. Now the heavy timber is nearly all cut off and the land farmed; large tracts of the more open country are also farmed and the tamarack swamps are largely cut and the land converted into meadow. Streams have been straightened, meadows and small lakes drained, and the country settled until it only slightly resembles its former condition.

In faunal position it is mainly Transition zone with a tongue of the Upper Austral on the south reaching up the Mississippi Valley below St. Paul and on the other side the Canadian zone beginning with the white pine and hemlock timber forty miles to the northeast. Many Canadian zone species are found in the swamps, however, where the deep sphagnum moss often holds the winter ice into June. In recent years a few Upper Austral species of mammals have extended their range up the immediate valley of the river to this point.

The records of eighty years past show the disappearance of many of the game and larger animals and some of the smaller Canadian zone species. Also a few of the Upper Austral species are making their appearance from the south and west.

In cases where measurements are given they are the standard set of total length, tail vertebrae, and hind foot in millimeters. Weights of smaller mammals where given are in grams and milligrams, of the larger in pounds and ounces.

Scalopus aquaticus machrinoides Jackson.—Missouri Valley Mole. Common in the dune-sand region. Rare in heavy land and gravelly soil. Several well grown young were trapped in runways between June 20 and 30, 1927. Average measurements of three males: 165.7, 30, 22.3; largest, 171, 31, 24. Average weight of the same specimens: 82.3 grams; heaviest, 92. A female measured: 158, 30, 21, and weighed 59.5 grams.

Condylura cristata (Linnaeus)—Star-nosed Mole. There is one specimen from Elk River in the Merriam collection in the U. S. National Museum, collected by Vernon Bailey in 1885, and several others were taken about the same time. None has been recorded in recent years.

Microsorex hoyi hoyi (Baird).—Hoy's Pigmy Shrew. The writer has collected six specimens: One March 29, 1925, and one March 27, 1926, were within a few feet of the same spot in cold sphagnum in a tamarack swamp; one October 14, 1925, and one March 25, 1926, were taken on high dry sand ridges in closely pastured situations; and two were caught September 21, 1927, in heavy grass at the edge of a rice lake. In the Merriam collection, now in the U. S. National Museum, are eight specimens collected at Elk River by Vernon Bailey in 1885 and 1886. Average measurements of three males: 81.3, 31, 10; largest, 88, 31, 10. Average weight of the same specimens: 2.8 grams; heaviest; 3.5. A female measured 85, 30, 10, and weighed 3.2 grams.

Sorex cinereus cinereus Kerr.—Masked Shrew. Abundant and nearly evenly distributed. Somewhat less common in the drier, less sheltered situations. There is a series of 58 specimens in the Merriam collection in the U. S. National Museum taken at Elk River from 1885 to 1887 by Vernon and Anna Bailey. A female collected June 29, 1925, contained seven embryos. Another taken April 17, 1927, contained five small embryos. Average measurements of twenty males: 90.6, 38.4, 11.7; largest, 104, 40, 12. Average weight of the same specimens: 3.3 grams; heaviest, 5.3. Average measurements of six females: 90.2, 38.5, 11.5; largest, 95, 40, 12. Average weight of the same specimens: 3.0 grams; heaviest, 4.1.

Sorex arcticus laricorum Jackson.—Black-backed Shrew. Fairly common in marshes surrounding rice lakes. Only two specimens have been taken in other situations; these were taken under an old stump in a tamarack swamp. A female collected April 27, 1922, contained six embryos. Another taken June 1, 1927, contained nine very small embryos. Average measurements of six males: 106, 39.6, 14.8; largest, 119, 43, 15. Average weight of the same specimens: 7.8; heaviest, 9.6 grams. Average measurements of four females: 106.7, 40.2, 13.5; largest, 110, 41, 14. Average weight of the same specimens: 6.8 grams; heaviest, 7.5.

Sorex palustris hydrobadistes Jackson.—Water Shrew. The author has taken only two specimens; one in the hands from the inside of a muskrat house and the other trapped in the marsh surrounding the same lake. It is not uncommon to see them in muskrat houses in winter, but it seems to be difficult to get them into traps. Merriam (N. A. Fauna no. 10, p. 92) cites seven specimens from Elk

River under *Sorex palustris*. These were taken in 1885 to 1887 by Vernon Bailey along the creek banks in the natural meadows before they were drained.

Blarina brevicauda brevicauda (Say).—Short-tailed Shrew. Usually common; occasionally rare. There seems to be little choice of habitat. A female collected May 22, 1927, contained five very small embryos. Average measurements of five males: 123, 26.2, 16.4; largest, 126, 28, 17. Average weight of the same specimens: 22.5; heaviest, 23.5 grams. Average measurements of seven females: 123, 27.3, 16.3; largest, 134, 30, 17. Average weight of the same specimens: 21.8 grams; heaviest, 25.5.

Myotis lucifugus lucifugus (Le Conte).—Little Brown Bat. The most common of our bats, out-numbering all other species by probably one hundred to one. In fall they become very fat before leaving the county. A *Myotis* was seen October 5, 1921, and specimens of this species were collected September 16 and 25, 1924. The earliest spring record is that of *Myotis* seen April 29, 1922, and April 27 and 30, 1923, which were probably of this species. Specimens were collected May 4 and 6, 1926. The earliest record of embryos is May 30, 1925, when three females were collected, two of which contained embryos; the other, and one collected May 29, 1923, did not contain any. Several specimens collected during the first week in June all contained embryos. No specimens have been taken between June 8 and 27. Many specimens have been examined between June 27 and July 10, all of which were at the time nursing, or had recently nursed, young. Average measurements of thirteen specimens: 91.7, 38.7, 10.2; largest, 107, 42, 11. Average weight of the same specimens: 7.7 grams; heaviest, 12. Average expanse of five specimens: 255; greatest expanse, 278.

Myotis keenii septentrionalis Trouessart.—Trouessart's Bat. An adult male was collected from a pile of wood May 19, 1925. Miller and Allen (Bull. U. S. Nat. Mus. 144, p. 107) cite two specimens from Elk River.

Lasionycteris noctivagans (Le Conte).—Silver-haired Bat. This is not a very rare species, though they can not be called common. They are out-numbered only by *Myotis lucifugus*. The first silver-haired bats usually appear at night between fifteen and twenty minutes after the little brown bat. Four females taken May 20, 1925, May 28, 1923, and June 2, 1923, contained two embryos each. One taken May 30, 1925, showed no signs of having bred. One taken July 9, 1923, was nursing young at the time. Average measurements of three adult females: 105.3, 39.3, 9.3, with a wing expanse of 292.3; largest, 108, 41, 10, with an expanse of 295 mm.

Nycteris borealis borealis (Müller).—Red Bat. On June 30, 1921, one was seen feeding over the Elk River at 11:00 a.m. in bright sunlight when the temperature was 98 degrees in the shade. A male was taken September 30, 1924.

Nycteris cinerea (Beauvois).—Hoary Bat. A female taken July 9, 1923, as it came to a small pond for water, was nursing young at the time but was not carrying them with her. A bat, which by the description given could hardly have been any other species, was reported as having fallen from a tree in the village of Elk River, about the middle of July, 1926. It appeared to have been overcome by heat. It was on one of the hottest days of the summer. Two young were found to be attached to the nipples when it was picked up.

Euarctos americanus americanus (Pallas).—Black Bear. The early settlers say that bears did not winter here but came down from the north occasionally

in summer and early fall. One killed by Charles A. Bailey in the fall of 1887 and a track seen by him in the summer of 1888 seem to be the latest records.

Procyon lotor lotor (Linnaeus).—Raccoon. Once abundant; fairly common until 1915; now one of our rarest fur-bearers. Only an occasional track is reported. A large and very fat male weighed 30.5 pounds. Three young of the year, well grown and very fat, taken early in December, 1906, weighed 20 pounds each.

Mustela cicognanii cicognanii Bonaparte.—Bonaparte's Weasel. The most common carnivore. When meadow mice are abundant for two or three years these weasels become very common, but when the mice are scarce they also become very scarce. The change from brown to the white pelage usually begins about November 1 and is nearly or quite complete by December 1. This varies two or three weeks either way depending as to whether the season is early or late. Average measurements of six males: 309.5, 85.2, 41.7; largest, 333, 90, 44. Average weight of the same specimens: 136.5 grams; heaviest, 200. Average measurements of two females: 244.5, 61.5, 32.5; largest, 249, 63, 33. Average weight of the same specimens: 68.5 grams; heaviest, 77.

Mustela longicauda spadix (Bangs).—Minnesota Long-tailed Weasel. Found in about the proportion of one of these to two of the Bonaparte's weasel. More often found in the open timber and about the dry ridges and fields. A male measured 467, 165, 55, and weighed 18 ounces. A female measured 380, 121, 43, and weighed 209.5 grams.

Mustela vison letifera Hollister.—Mink. Still fairly common. Trapping seems to have less effect on the numbers of mink than on any of the other fur-bearers. This may be in part the cause of the recent scarcity of muskrats. When the water was low and the muskrats were driven into the rivers, mink found it an easy matter to secure them and came very near completing their extermination. Average measurements of three males: 614.7, 196, 69; largest, 623, 208, 72. Average weight of five males: 2.6 lbs.; heaviest; 3 lbs. 2 oz. A female measured 516, 161, 58, and weighed 1 lb. 6.75 oz.

Lutra canadensis canadensis (Schreber).—Otter. At present very rare. Some sign can usually be found in suitable places along some of the rivers. Tracks were seen daily along the St. Francis River, in the town of Orrock, during the first half of April, 1926.

Spilogale interrupta (Rafinesque).—Spotted Skunk; Civet. First reported in the region in 1922 when H. D. Hoblitt caught one on the Wright County side of the Mississippi River south of Big Lake. Since that time one or two have been taken along the Elk and Mississippi rivers between Elk River and Big Lake every year. They are common farther south in the Upper Austral zone.

Mephitis minnesotae Brass.—Minnesota Skunk. Still fairly common but their numbers have probably decreased 75 per cent in the last ten years. Skunks den up for the winter as soon as the first heavy snows come, which is sometimes in October and sometimes not until January. The earliest record of tracks in spring is February 3, 1921, when several were seen. They are nearly always common by the end of February. An adult male measured 680, 250, 90, and weighed 9.5 pounds. Another very large, fat male weighed 14.5 pounds. A very thin female taken in the spring measured 610, 225, 65, and weighed 3.5 pounds.

Taxidea taxus taxus (Schreber).—Badger. Badgers are not uncommon and are apparently increasing from year to year. They do not seem to hibernate for

long periods, as tracks have been found many times in every month of the year. Usually when a track is discovered in the winter, and followed, it will be found that the badger has caught some animal about the size of a rabbit or woodchuck which has been dug out and dragged to the badger den. If such is the case the badger usually stays in two or three weeks. Sometimes they will dig into a woodchuck or skunk den and stay a month or more. If no food is at hand they will not remain in more than two or three days. Weather does not seem to make any difference, as they are just as apt to come out when it is thirty degrees below zero as on nights when it thaws all night. On November 23, 1920, the writer dug out a skunk den that had been entered the night before by a badger and found that the skunks had apparently all been killed, as one was found buried two feet below the surface. When skinned it was found to have apparently every bone in the body broken. Tracks of several skunks had been followed into this den but no more animals could be found. The ground seemed to have been all worked over and smelled of skunk. There were holes below that it was not possible to reach in the time that could be spent in digging, and, as it was evident that the badger was still there, it was probable that the other skunks had been killed and buried for future use. An adult male measured 812, 132, 115, and weighed 24 pounds. A female measured 795, 150, 105, and weighed 17 pounds.

Vulpes fulva regalis Merriam.—Yellow Red Fox. Common up to about 1887; now unknown. The type was collected at Elk River on March 5, 1887, by Vernon Bailey. The last record available is that of a young of the year that was killed on an island in the Mississippi River south of Elk River sometime in May or June, 1891, by J. S. Mills.

Urocyon cinereoargenteus ocythous Bangs.—Wisconsin Gray Fox. A male was taken by a trapper six miles west of Elk River, November 2, 1927.

Alopex probilofensis? (Merriam).—Blue Fox. Not native, and though these foxes have not been found in Sherburne County it seems that a note on escaped animals should be included, as Anoka, where they escaped, is only ten miles from our borders. In a letter of March 7, 1928, Thaddeus Surber of St. Paul has kindly furnished the following notes. "It seems that about a year ago Monahan and Morris of Minneapolis lost about forty of these animals which either escaped through the pens or were released by some unknown parties. From the information that I have been able to obtain they recovered but eighteen of them. They were all lost in the vicinity of Anoka. In addition to that, I. Bowman of Rosetown lost six of these blue foxes two years ago, only one of which was ever recovered, so that there must be somewhere between twenty-five and thirty of these animals scattered over the territory between the Twin Cities and your section of the country. One or two have been seen in the vicinity of Stillwater, while only the other day, March 6, Warden Frederickson saw one near Valentine Lake in Ramsey County, and six others have been reported as having been seen during the winter in the Anoka Refuge."

Canis latrans Say.—Coyote. Coyotes first appeared in Sherburne County in 1875, and one was killed by Charles A. Bailey in 1876. In 1882 and 1883 they were so numerous that they killed many sheep and up to twenty years ago they were very common, but a bounty was placed on the young and they were rapidly thinned out. Now a few are always present but they can not be called common. A den was found April 29, 1907, containing nine young about four or five days old.

On May 21, 1923, six young, which averaged 763 mm. in length, were taken from a den in a sand hill.

Canis lycaon Schreber.—Timber Wolf. In the early seventies a rare straggler into the region. Reports of old hunters place the last occurrence at about the winter of 1886–1887.

Lynx canadensis canadensis Kerr.—Canada Lynx. Apparently an irregular visitant. Reported as scarce by Vernon Bailey in 1887. One was seen by Charles A. Bailey in the spring of 1893. Not reported again until June 28, 1927, when Frank Kight killed a female three miles southwest of Zimmerman. This specimen previously had been caught by a front foot in a wire snare, had twisted the wire off short, and escaped. The wire, remaining in a loop just above the toes, had cut through the skin for about half the distance around the foot, and had been overgrown by the skin for most of the distance. The lynx was rather thin and was evidently quite lame. This specimen measured 885, 90, 250 mm., and weighed 18.5 pounds.

Lynx rufus rufus (Schreber).—Bobcat. Never common, but reported as rather frequent forty or fifty years ago. One seen near Elk River in January, 1915, and what was probably the same individual was reported killed a few miles away two or three weeks later.

Marmota monax rufescens Howell.—Rufescent Woodchuck. The type of this subspecies was collected by Vernon Bailey at Elk River in 1886, at which time they were common in the region. Now they are rare, a condition for which badgers may be largely responsible. They usually appear in spring sometime during the first half of March; earliest record March 11, 1920. A litter of young, found out of the den and playing on June 5, 1927, ran into a hollow tree and escaped before they could be counted. They were very active and climbed the tree several feet to the entrance with nearly the agility of a squirrel. An adult male measured 591, 168, 100, and weighed 7 pounds. An adult female measured 570, 120, 78, and weighed 7.25 pounds.

Citellus franklinii (Sabine).—Franklin's Ground Squirrel; Gray Ground Squirrel. Very local in distribution. They sometimes colonize in considerable numbers but generally a colony contains not more than a dozen adults. Numerous inquiries among farmers in 1925 and 1926 failed to reveal a single colony though a few scattered individuals were seen. In 1927 one colony was reported and several scattered individuals were seen. Earliest records of activity in spring are April 21, 1920; April 26, 1921; April 28, 1922; April 27, 1925. An adult female collected May 7, 1925, contained ten well developed embryos.

Citellus tridecemlineatus tridecemlineatus (Mitchell).—Striped Ground Squirrel. Common. Found in all dry situations except in heavy timber. In fall the majority disappear in September though a few are usually out until October. In 1925 the last one was seen September 18, while in 1920 they were out until October 11. In 1921 one was seen November 4, and a neighbor's cat brought one in November 27. In spring they usually appear the second week in April, rarely the first week; earliest April 5, 1920; April 2, 1921; April 5, 1927. On May 6 and 8, 1925, I collected six females, all of which contained well developed embryos. The smallest number found was seven and the largest thirteen; average nine. A female taken April 24, 1927, contained ten small embryos. One on May 16 contained twelve and another six large embryos, while on May 23 two were

taken that were nursing young. In the above notes I have counted only live embryos. In examining large numbers of gravid females I find that fully one-half contain one or two (rarely three) dead embryos. Average measurements of six males: 283, 96.5, 39; largest, 296, 101, 40. Average weight of the same: 153.3 grams; heaviest, 179. Average measurements of five females: 264, 97.6, 33.4; largest, 292, 105, 39. Average weight of same: 169.1 grams; heaviest, 195.

Tamias striatus griseus Mearns.—Gray Chipmunk. Common wherever there is timber or brush. They appear in spring in March, the date depending on the weather. One was seen March 12, 1920. On March 7, 1927, one was seen about the house at home but went back into the hole and did not come out again until March 12. Several tracks were seen in the woods on the latter date. The majority go into winter quarters in October, frequently during the first week. Extremely late dates are November 11, 1919; November 8, 1920; November 7, 1921. Early in December, 1923, while repairing a woodshed, I destroyed the winter stores of a chipmunk that had been active until the middle of October after which it had not been seen. On October 15 it reappeared and for the next ten days was by far the busiest chipmunk I ever saw, carrying away acorns. But soon finding that the corncrib nearby had been filled, it abandoned acorns and took corn instead. A female taken March 30, 1927, contained a mass of unformed embryos. Another taken on May 24, 1927, was nursing young. Average measurements of two males: 249, 93.5, 34; largest, 251, 100, 35. Average weight: 102.5 grams; heaviest, 106. Average measurements of four females: 241.3, 99, 35; largest, 259, 105, 35. Average weight, 98.9 grams; heaviest, 104.

Sciurus hudsonicus minnesota Allen.—Minnesota Red Squirrel. Fairly common in heavy timber and tamarack swamps. Rare in the more open timber. A female collected April 11, 1926, contained three embryos.

Sciurus carolinensis hypophaeus Merriam.—Minnesota Gray Squirrel. These squirrels are abundant wherever there is any timber. Their food is mainly acorns of numerous species of oaks, except where access is to be had to corn, when acorns are abandoned. Large numbers of ears are cut from the stock from the time that the corn is in the roasting-ear stage until it is placed out of reach. Where corn is left in the field the greater part of the winter, a considerable amount of damage is done. Elk River is the type locality of this squirrel. Average measurements of 3 males: 489.3, 221.7, 68.7; largest 510, 225, 73. Average weight of the same specimens: 1 lb. 4.7 oz.; heaviest, 1 lb. 8 oz.

Sciurus niger rufiventer Geoffroy.—Western Fox Squirrel. First report in Sherburne County in the fall of 1924. In the fall of 1925 reports indicated that they had reached nearly to the middle of the county. A specimen was brought to me on October 10. During the falls of 1926 and 1927 they were not uncommon and several specimens were taken. An old female collected October 31, 1927, measured 562, 252, 76.

Glaucomys volans volans (Linnaeus).—Little Flying Squirrel. Fairly common in the timbered part of the county. Apparently not as active in winter as in summer though they have been found in every month of winter, and tracks that had been made when the thermometer was registering thirty degrees below zero have been seen in the snow. A female collected March 29, 1925, contained three small embryos. Another collected March 29, 1927, contained two embryos. On April 21, 1927, a female and four very small young were taken from a nest four

feet from the ground in a natural cavity in a small tree. On April 26, 1927, a nest that contained five very small young was found in an old woodpecker's hole. The former of these nests was composed entirely of finely cut oak leaves, while the latter was of rabbit fur. Average measurements of six specimens: 232.7, 97.2, 30.7; largest, 240, 105, 32. Average weight of the same specimens: 69.3 grams; heaviest, 75.5.

Glaucomys sabrinus macrotis Mearns.—Mearns' Flying Squirrel. In the eighties almost as common as the little flying squirrels, but more confined to the swamps and heavy timber as would be expected from their Canadian zone range. In recent years very scarce and rarely found. On February 2, 1924, I took three males from an outside nest twelve feet up in a tamarack. The nest was built on horizontal limbs against the side of the tree and was composed of small twigs and tamarack needles.

Geomys bursarius bursarius (Shaw).—Mississippi Valley Pocket Gopher. Very common in sandy soil, less so in heavy land, rare in dense timber, and absent from wet land. Embryos have been noted from April 12 to May 22. The usual number of young seems to be two or three, rarely one or four. On April 25, 1926, I secured a female containing five embryos, the largest number I have seen. Vernon Bailey (Bull. no. 5, Div. Ornithology and Mammalogy, U. S. Dept. Agric., p. 33) states "A female collected May 14, 1886, at Elk River, Minnesota, contained two embryos; and on the same day a nearly half-grown young was caught. At the same locality on April 29, 1888, I found a young hardly one-third grown that had come out of the burrow during a cold rain and had been chilled to death." Average measurements of three males: 261.6, 74, 35; largest, 270, 80, 36. Average weight of the same specimens: 220.6 grams; heaviest, 225.6. Average measurements of five females: 250.2, 73.4, 32.8; largest, 268, 80, 37. Average weight of the same specimens: 195.3 grams; heaviest, 224.

Perognathus flavescens perniger Osgood.—Dusky Pocket Mouse. Fairly common in the dune-sand region. Not recorded elsewhere in the county. In the fall seeds are stored for the winter, usually from two to four quarts. I have never seen anything except weed seeds in the caches, mostly of pigeon grass and wild buckwheat. I have found evidence of tame buckwheat being eaten but no other grain, though grain fields seem to be the favorite habitat. Vernon Bailey (N. A. Fauna, no. 49, p. 123) mentions seeds of the sandbur in their caches. These tiny mice are active in fall until the ground freezes. On November 10, 1921, ten inches of snow fell before the ground froze, and remained until spring. On November 23 I found one of these mice that had come out on the snow and become lost, wandering about until overcome by cold. In the spring they are out as soon as the frost is out of the ground enough so they can dig. The earliest record is that of a male trapped on March 22, 1926. A female taken May 18, 1921, contained six small embryos. Another taken alive May 13, 1926, gave birth to five young on the fifteenth, all of which died on the afternoon of the sixteenth. Vernon Bailey (N. A. Fauna, no. 49, p. 122) cites three females collected July 30 and August 12, 1912, and containing four embryos each. Average measurements of twenty-two males: 117.6, 51.9, 16.6; largest, 125, 57, 17. Average weight of the same specimens: 9.7 grams; heaviest; 11.6. Average measurements of eight females: 117.8, 51.5, 16.8; largest, 123, 54, 17. Average weight of the same specimens: 7.9 grams; heaviest, 9.25.

Castor canadensis canadensis Kuhl.—Canadian Beaver. The beavers were all gone from the county before the arrival of my people in 1867 and had been gone a long time then, though evidence of great abundance remained in old dams and ponds and extensive marshes caused by their work of centuries past.

In the fall of 1927 the work of a small colony of beavers was discovered along the banks of the St. Francis River in the township of Orrock. On May 7, 1928, their cuttings of poplar along the shores were fairly fresh but seemed to have been mostly cut during the previous fall. Where the beavers came from is a mystery.

Peromyscus maniculatus bairdii (Hoy and Kennicott).—Prairie White-footed Mouse. Common in fields and grassy prairies. Never found in timber and only rarely taken in small brush even when surrounded by grassy prairie. Specimens containing embryos have been taken from March (March 13, 1924) to October (October 24, 1925). Usually five or six young are produced at a litter. On April 23 and 24, 1927, I trapped five young about one-third grown. Their tracks were followed from one hole to another at a distance of one hundred yards from each other. The animals were found to have eaten many weed seeds and were apparently nearly if not quite independent of the mother. Average measurements of eighteen males: 137.1, 51.4, 18.2; largest, 145, 59, 19. Average weight of the same specimens, 15.7 grams; heaviest, 18.5. Average measurements of twelve females: 131.2, 50.6, 18.9; largest, 156, 63, 19. Average weight of the same specimens: 13.9 grams; heaviest, 19.5.

Peromyscus leucopus noveboracensis (Fischer).—Northern White-footed Mouse. Common everywhere in timber and brush as well as about buildings and grain fields where grain is to be obtained. From March 25 to April 15, 1927, I trapped two or three females every day, only one of which showed signs of having bred. This one was taken April 10, and contained four half-grown embryos. On April 21, 1927, three females were trapped; one of them was nursing young; one contained four, and the other five, large embryos. On May 17, 1927, three females were taken which had recently nursed young. Another taken May 28, was still nursing young and contained four embryos about one-third grown. Average measurements of eleven males: 166.8, 69.3, 21.2; largest, 174, 78, 22. Average weight of the same specimens: 21.4 grams; heaviest, 24.5. Average measurements of nine females: 161.8, 70.2, 21.6; largest, 171, 77, 22. Average weight of the same specimens: 18.6 grams; heaviest, 24.5.

Synaptomys cooperi cooperi Baird.—Cooper's Lemming Mouse. Not common but probably not as rare as would seem from results of trapping. Of sixteen specimens taken in recent years, eight were taken in sphagnum bogs, five in sedges and three in bluegrass. All were taken in runways of meadow mice. None had touched the bait and all had evidently tried to jump over the trap, as, in every case, the skull was broken by the trap jaw on the opposite side of the trap from that which the mouse had approached, or else they had jumped so far that they were taken across the hips. The seven or eight specimens collected by Vernon Bailey in 1885 to 1887 were caught in the swamps and meadows or brought in by cats, and little was learned of their habits. Average measurements of five males: 115, 20.6, 17.8; largest, 118, 21, 18. Average weight of the same specimens: 25.6, grams; heaviest, 30.3. Average measurements of two females: 113.5, 20.5, 17.5; largest, 117, 21, 18. Average weight of the same specimens: 21.4 grams; heaviest, 22.7.

Clethrionomys[1] **gapperi loringi** (Bailey).—Red-backed Mouse. Sometimes rare but usually may be found in small numbers in any timber or brushland that is not too dry. Generally abundant in tamarack swamps when these are not entirely under water. On June 18, 1920, I found a nest four inches below the surface of the ground in sandy loam soil. It was placed at the foot of a large tree where there was very little surface cover. As I had been digging around the tree before finding the nest I was unable to trace the entrance. The nest contained four young about four days old. On May 17, 1927, I trapped two females that had recently nursed young. Average measurements of sixteen males: 119.8, 31.9, 18.0; largest, 129, 35, 19. Average weight of the same specimens: 17.1 grams; heaviest, 20.5. Average measurements of eight females: 128, 34.6, 18.3; largest 141, 37, 19. Average weight of the same specimens: 17.8 grams; heaviest, 21.

Microtus pennsylvanicus pennsylvanicus (Ord).—Eastern Meadow Mouse. Abundant everywhere except on the high, dry ridges where they occur only in grain and alfalfa fields. In the spring and summer of 1924 these mice seemed to be unusually common. During July and August many were found during haying time and every individual examined was infested with warbles. Late in the fall of 1924 and the early summer of 1925 they were very scarce. By the fall of 1926 they were again very common, but no warbles were seen in either of the two latter years. In the fall of 1927 they were still as common as usual. As I was out of the state through the summer I do not know whether there were warbles or not, but none was reported. Females containing embryos have been found in every month except December and January. Young with eyes unopened were common until December 15, 1925, and a female taken February 2, 1926, contained four embryos nearly ready for birth. Average measurements of thirteen males: 150.5, 41.4, 20.2; largest, 165, 47, 21. Average weight of the same specimens: 30.5 grams; heaviest, 45.6. Average measurements of seven females: 157.1, 47.1, 20; largest, 170, 50, 22. Average weight of the same specimens: 38.3 grams; heaviest, 67.8.

Microtus minor (Merriam).—Little Upland Mouse. At present one of the rarest mice of the region, though abundant in 1886 and 1887. They are found only in the dune-sand region, generally in the shallow pockets of the higher ridges where there is a considerable growth of Jersey tea or prairie willow. A few have been found about the borders of meadows and occasionally in grain fields. In the spring of 1927 they were found to be fairly common in the high sand-dunes. They were still in the winter dens, where they remained until April 15, after which they began to scatter out, and by April 25 the winter dens were nearly abandoned. All dens were in bunches of choke-cherry, sand-cherry, or mixed thickets of prairie willow and Jersey tea. It was not uncommon to find from a half-bushel to a bushel of small twigs of the willow and tea, cut into lengths of two or three inches and completely denuded of bark, about one of these dens. No dens were found about which there were no pealed twigs. About fifty specimens were taken in the last half of March and the first half of April. One, taken April 15, containing three fair-sized embryos, was the only evidence of breeding at this place. A female taken April 11, 1926, contained five embryos. Average measurements of thirty-three males: 129.0, 30.2, 16.2; largest, 144, 39, 17. Average weight of the same specimens: 22.8 grams; heaviest, 29. Average measurements of fifteen

[1] Formerly *Evotomys*.

females: 126.5, 30.4, 16.2; largest, 145, 35, 17. Average weight of the same specimens: 19.6 grams; heaviest, 28.6.

Ondatra zibethica zibethica (Linnaeus).—Muskrat. Formerly abundant. In 1921 a series of dry years commenced and continued until July, 1926, by which time the small streams and ponds were dry, and water was found only in the larger rivers and lakes. Though there has been no open season on muskrats for several years, they decreased until by 1925 they were one of the rarest of fur-bearers, for which dry weather together with the relative abundance of mink seems to be responsible. By the fall of 1927, the ponds and sloughs were filling up and the muskrats were more common than at any time since 1920. Average weight of nine males: 1 lb. 14 oz.; heaviest, 2 lbs. 9.5 oz. Average weight of two females: 1 lb. 9.37 oz.; heaviest, 1 lb. 11.25 oz.

Rattus norvegicus (Erxleben).—Norway Rat. Common since about 1880. Rat-proofing of buildings in recent years is gradually thinning them out. There seems to be not more than 50 per cent of the former numbers here now.

Mus musculus Linnaeus.—House Mouse. Abundant about buildings and common in grain fields.

Zapus hudsonius campestris Preble.—Prairie Jumping Mouse. Very irregular from year to year, out-numbering all other species over a considerable area one year and the next summer not a single specimen can be taken. There seems to be no choice of habitat. I have found them in about equal numbers in wild rice beds, in tamarack swamps, in grain fields and alfalfa, in low sedge marshes, and on the tops of the highest, dryest ridges. They become very fat in fall and hibernate through the winter. The latest date on which I have found them in fall is October 24, 1925. On April 15, 1927, a line of thirty-five traps was set, in a locality where I had reason to believe these mice had occurred the previous fall, with the idea of determining the time of their coming out of hibernation. No specimens were taken until May 2 when a male was found in one of the traps. On May 4 another was taken, and on May 5 three more. By May 30 twenty-three males had been taken. The first females taken were two specimens on May 23. On May 24 another was found and on the twenty-sixth three more. By May 30 ten had been secured, of which one taken on the last date contained six very small embryos. Average measurements of twenty-one males: 209.2, 123.0, 29.5; largest, 225, 131, 31. Average weight of the same specimens: 16.0 grams; heaviest, 19.3. Average measurements of ten females: 207.5, 121.2, 28.9; largest, 220, 125, 30. Average weight of the same specimens: 15.4 grams; heaviest, 18.7.

Erethizon dorsatum dorsatum (Linnaeus).—Porcupine. One killed by a hunter near Elk River in 1888 and made into a specimen by Anna Bailey Mills, is now in the collection of Vernon Bailey in Washington, D. C.

Lepus townsendii campanius Hollister.—White-tailed Jack Rabbit. Formerly common over the prairies west of the Mississippi River but not reported from Sherburne County until about the beginning of the present century. At present they occur sparingly over a large part of the county. An adult male collected March 6, 1927, measured 575, 72, 145, and weighed 6 pounds.

Lepus americanus phaeonotus Allen.—Minnesota Snowshoe Rabbit; Varying Hare. These rabbits were fairly abundant until about the close of the nineteenth century, after which they rapidly decreased until by 1905 they were rare. From 1910 to 1920 hardly a track could be found and days spent by photographers in

attempts to find the animals failed to reveal their presence. Since that time a few have returned to the larger swamps. Average measurements of three specimens collected March 14, 1926, were: total length 436, tail 33, hind foot 134; largest, 445, 35, 135. Average weight of the same specimens: 3 lbs. 6.6 oz.; heaviest, 3 lbs. 8 oz.

Sylvilagus floridanus mearnsii (Allen).—Mearns' Cottontail. The cottontail arrived in the extreme southeastern part of the county about 1875 and became common at Elk River about 1880. During 1915, 1916 and 1917, rabbits were very scarce. A trip of several miles in the woods frequently failed to reveal a single track even when good tracking snow had been on the ground for several days. After this they rapidly increased until by 1920 they were again abundant remaining so until the spring of 1927. During the summer of 1927 they did not seem to increase and during the fall several sick rabbits were reported, boys saying that they could walk up and step on them. By Christmas they were again quite scarce and by March 1 were almost gone. Average measurements of 8 males: 417, 39.8, 100; largest, 473, 43, 117. Average weight of the same specimens: 2 lbs. 9.37 oz.; heaviest, 3 lbs. 6 oz.

Cervus canadensis canadensis Erxleben.—American Elk; Wapiti. The elk were practically gone from Sherburne County when Orlando Bailey came here in 1851. Old elk horns were frequently found on the ground even up well into the eighties and the elk bones found in the springs indicated the former abundance of the animals that gave the river its name. An antler found in a peat bog in June, 1918, was still in fairly good condition though the tips of the tines were gone.

Odocoileus virginianus borealis Miller.—Northern White-tailed Deer. From 1867 to 1885, deer were fairly abundant in much of the county and to the early pioneers were a valuable source of food, buckskin for clothing, and tallow for candles. From 1885 to 1890, they rapidly disappeared before the settling of the country and the increasing numbers of hunters. For many years they have been very scarce but a few still work down from the north in summer and fall. Two were killed near Elk River in 1910 and one near Becker in 1924 or 1925. Tracks were reported near Elk River several times in 1923 and 1924, and a fresh track was seen there in June, 1927.

Bison bison bison (Linnaeus).—Buffalo. When my great uncle, Orlando Bailey, came here in 1851, the buffaloes were gone from the immediate valley of the Mississippi along the traveled Red River Trail from Pembina to St. Paul, but they were still abundant on the prairies of the western part of the state. Even their bones were no longer found on the surface of the ground when my grandfather came in 1867, but in the springs on our meadows on the old Bailey homestead great numbers of buffalo bones were dug from the mud when the springs were cleared for the cattle in the eighties, before the marshes had been ditched and the springs dried up. In 1887, Vernon Bailey found the buffaloes all gone from the state, but tons of their bones were stacked up at the railroad stations along the western border of the state near Bigstone and Traverse lakes.

Escondido, California.

A NEW WOLF FROM MEXICO

By E. W. Nelson and E. A. Goldman

The name *Canis mexicanus* Linnaeus, based on the "Xoloitzcuintli" of Hernandez (Rerum Medicarum Novae Hispaniae Thesaurus, p. 479, 1651) and generally assumed by authors to be applicable to a true Mexican wolf, has been shown by Glover M. Allen (Bull. Mus. Comp. Zool., vol. 43, no. 9, p. 478, March, 1920) to apply to the domesticated Mexican "hairless" dog. Some other name, as also pointed out by Allen, must therefore be used for the Mexican wolf if it should prove to be distinct. According to old residents wolves that formerly inhabited the southern end of the tableland, near the valley of Mexico, became extinct many years ago. Wolves are still numerous, however, in the Sierra Madre as far south at least as Durango. Study of accumulated material reveals the occurrence of a well marked new subspecies here described.

Canis nubilus baileyi[1] subsp. nov.

Mexican Wolf

Type.—From Colonia Garcia (about 60 miles southwest of Casas Grandes). Chihuahua, Mexico (altitude 6,700 feet). No. 98312, ♂ adult, U. S. National Museum (Biological Survey collection), collected by E. W. Nelson and E. A. Goldman, July 10, 1899. Original number 13895.

Distribution.—Southern and western Arizona, southern New Mexico, and the Sierra Madre and adjoining tableland of Mexico as far south, at least, as southern Durango.

General characters.—Most closely allied to typical *Canis nubilus*, but smaller; color darker, more brownish or rufescent; cranial characters, especially the slenderer, more depressed rostrum, distinctive. Somewhat similar in color to *Canis rufus*, but larger, and cranial characters indicate no close relationship.

Color.—Type (winter pelage being replaced by summer coat, July): Upper parts in general grizzled brownish gray, the back moderately overlaid with black, becoming pale buffy along flanks and outer sides of limbs; top of head, ears, and muzzle near ochraceous tawny; a narrow subterminal whitish band near shoulders; under parts pale, buffy whitish, varying to pale, grizzled grayish across throat; feet dull white; tail grizzled brownish gray above, and light buffy below, becoming black interspersed with a few gray hairs all around near tip. Some topotypes are paler, buffy grayish, and others darker, with top of head, ears, muzzle, and limbs more tawny than in the type.

Skull.—Similar in general to that of typical *C. nubilus*, but usually smaller

[1] Named for Vernon Bailey in recognition of his extensive studies of the life habits of wolves.

less flattened; frontal region higher, more arched, the frontal extensions between nasals and maxillae usually shorter and more evenly tapering to acute points; rostrum relatively more slender, more depressed near middle, rising more steeply posteriorly; nasals with inner margins more strongly turned downward, forming a deeper, V-shaped median trough; zygomata more widely spreading; ascending branches of premaxillae usually less prolonged posteriorly; dentition about the same. Compared with that of *Canis rufus* the skull is decidedly larger, with frontal region higher arched; and it differs notably in dentition, the upper carnassial with a less prominent internal cusp, and upper molars smaller; large upper molar with inner lobe narrower (measured anteroposteriorly), less broadly and evenly rounded.

Measurements.—Type: Total length, 1,570 mm.; tail vertebrae, 410; hind foot, 260. *Skull* (type and a larger male topotype, respectively): Condylobasal length, 250, 262; zygomatic breadth, 129.7, 144.2; width of rostrum (at constriction behind canines), 39.5, 41.2; interorbital breadth, 44.5, 46.2; alveolar length of upper carnassial, 24.1, 24.5; alveolar width (transverse diameter) of anterior upper molar, 19.3, 20.

Remarks.—In the unrevised state of the wolf group it seems desirable to indicate the relationship of the form here described to typical *C. nubilus* by subspecific designation. Specimens from the Escudilla Mountains in extreme east-central Arizona, and from the Mogollon Mountains region of New Mexico are generally larger and grayer and evidently grading toward the more northern *nubilus* type of animal. Revision of the group may, of course, result in the reduction of *nubilus* to subspecific rank, and the reassignment of the name here proposed. No close comparison with the geographic neighbor *C. rufus* of Texas seems necessary, as the latter appears to be specifically distinct. *C. rufus* is smaller, with a comparatively delicate, narrow, flattened, coyote-like skull, armed with relatively larger molars differing in important details as already indicated.

Specimens examined.—Total number, 65, as follows:

CHIHUAHUA: Colonia Garcia, 13; Colonia Juarez, 1; Gallego, 1; Sierra Madre (near Guadalupe y Calvo), 1.

DURANGO: El Salto, 1.

SONORA: Santa Cruz, 1.

ARIZONA: Arivaca, 2; Canille, 1; Chiricahua, 1; Cibecue, 1; Clifton, 2; Fort Bowie, 1; Fort Huachuca, 1; Galiuro Mountains, 1; Heber, 1; Helvetia, 2; Kendrick Peak, 1; Patagonia, 1.

NEW MEXICO: Animas, 5; Animas Valley, 2; Cloverdale, 6; Hachita, 8; Hatch, 1; Mescalero, 2; Sacramento Mountains, 7; San Luis Mountains, 1.

U. S. Biological Survey, Washington, D. C.

GENERAL NOTES

OPOSSUM IN CAPTIVITY

The night of March 5, 1928, while walking in the moonlight, I came upon an opossum (*Didelphis virginiana*) under some small cedars in the edge of a wood. I would probably have passed him by unnoticed had he not growled as I approached. He made no effort to escape, but faced me, growling savagely; nor did he follow the usual custom of his species by "playing 'possum" when I gave him a slight kick. He continued to growl and snap viciously after I had made a quick grab and picked him up by the tail.

A cage was made for him out of a large drygoods box. A few inches of sawdust were placed on the bottom of the cage and a quantity of oak leaves provided. He at once gathered all the leaves into a corner and made a nest of them, in which he spent all the hours of daylight for the first month. Now, two months after his capture, he will get out and eat almost any time that food is put in the cage. He eats almost anything, and in seemingly unlimited quantities. Corn bread forms the basis of his diet, but I have given him a number of newly shot starlings and English sparrows of which he leaves not a vestige except the feathers of the wings and tail. Fish heads and entrails, a dead chicken, and any kind of meat scraps are eaten readily.

About a week after his capture I noticed that one-fourth of his tail was gone, leaving a raw stump. A little later another section of it disappeared, leaving only half of its original length. As the cage is a tight box with one-fourth inch wire mesh tightly stapled over the open side, the only explanation is that he ate his tail. Since that time he has given up the idea of committing suicide by eating himself, and the stump has healed.

He has another habit that I would like to have explained. Water is kept in his cage in a pan eight inches across the top and about two inches deep. At frequent intervals I find him sitting in this pan of water. The discoloration of the water after these sitz-baths indicates that he voids his urine in it. He is a large, old male. I would like to know whether the tail-eating and the sitz-baths are characteristic.

On June 22, just after sunset, I placed a black snake (*Zamenis constrictor*), which I had been studying in captivity for some time, in the cage with the opossum. Neither paid any apparent attention to the other until it began to get quite dark. Then I saw the opossum make a quick pass at the snake's neck as it passed in front of him. Evidently he broke the snake's neck at one snap, as the snake made no further movement. Up to nine thirty the opossum had not begun to eat the snake, and I visited the cage no more until daylight next morning, at which time all that was left of *Zamenis* was about four inches of the tip of the tail and some shreds of skin. As the snake was three feet eight inches long, it must have made quite a full meal for the opossum.

Several times, soon after dark, the opossum uttered a wheezy bark, or possibly it may have been a loud sneeze, which was all the vocal sound he was heard to produce, except a low growl. This bark, if bark it was, could probably have been heard at a distance of 100 yards.

He continued the practice of sitting in his pan of water up to July 15, when I

was obliged to discontinue keeping him, and used him in some experiments on the food habits of the turkey vulture.—JOHN B. LEWIS, *Lawrenceville, Virginia.*

A CASE OF MATRICIDE IN THE OPOSSUM

On June 25, 1928, an adult female opossum (*Didelphis virginiana*) accompanied by six half-grown young were received at the American Museum of Natural History. They had been captured in New Jersey, not far from New York City, and had been sent to the museum in a heavy paper box. When they arrived all appeared to be in good condition, though some of the hair on the upper back and shoulders of the adult was missing. They were not fed the day they were received, but were placed in a large container covered by a screen.

The following morning the adult was dead. There was blood in her pouch and blood on the muzzles of two or more of the young. An examination of the pouch revealed a mass of clotted blood that covered the entire mammary area. Removal of the blood disclosed the mutilated remains of the teats or their position, for most of them had been chewed off.

The mammary glands of the mother were enlarged and the young had probably been receiving a part of their food by nursing. Perhaps fright at being captured and confined had caused a cessation of lactation, and the persistence of the young animals in their efforts to nurse caused hemorrhages that resulted in the mother's death.

In contrast to this case was that of a female opossum with several young ones which were sent to the museum more than a year ago, and in which case it was found the mother had eaten all the young ones during transit.—H. C. RAVEN, *American Museum of Natural History, New York City.*

A CHANGE OF NAME FOR MUSTELA MINOR DOUGLASS

In a paper entitled "New Vertebrates from the Montana Tertiary" (Ann. Carnegie Mus., vol. 2, p. 192, fig. 30, 1904) the present writer named as a new species from the Loup Fork beds of Lower Madison Valley, Montana, a small species of the Mustelidae which he called *Mustela ? minor*. Dr. E. Raymond Hall, of the California Museum of Vertebrate Zoology, has recently called my attention to the fact that, according to Miller (Catalogue of the Land Mammals of Western Europe, pp. 402 and 415, London, 1912), this name previously had been applied to two other species. The citations by Miller (*loc. cit.*) are as follows: "1820. *Mustela minor* Nilsson, Skand. Fauna, I, p. 35 (renaming of *vulgaris*).", and "1777. [*Lutra*] *minor* Erxleben, Syst. Regni Anim., I, p. 451 (renaming of *lutreola*)." Miller (*loc. cit.*) places Nilsson's name as a synonym of the Recent *Mustela nivalis nivalis* and Erxleben's name as a synonym of *Mustela lutreola*, the Recent European mink. Accordingly, *Mustela minor* Douglass would seem to be not a tenable name for the species so designated (*loc. cit.*, p. 192) and I here propose as a name to replace it, **Mustela ? madisonae.**—EARL DOUGLASS, *Salt Lake City, Utah.*

HABITS AND DISTRIBUTION OF THE ROCK SQUIRREL IN SOUTHERN NEW MEXICO

The rock squirrel, *Citellus grammurus grammurus*, is common among the rocky walls and ledges of the canyons in the Sacramento Mountains in southern New Mexico. The following observations were made during July, 1927, in the Alamo-

gordo region of New Mexico, while I was a member of the University of Michigan-Walker-Harris Expedition.

The vertical distribution of this animal is from 4200 to 8500 feet, from the desert Tularosa Valley at Alamogordo to the mountain top. Very few were observed in the valley and only one at 8500 feet. Between these two extremes, at Highrolls at an altitude of 5600 feet and in the La Luz Canyon at an altitude of 4800 feet, these squirrels were observed in abundance.

The vegetation in the desert valley was dominantly mesquite (*Prosopis glandulosa*). The animals lived here in burrows under the larger mesquite bushes. In the La Luz Canyon, as in the Fresnal Canyon at Highrolls, the burrows were found abundantly between the rocks in the walls of the canyons. The openings into the burrows in the La Luz Canyon were well padded with mesquite leaves and bean pods and I should suspect that the nests were padded likewise. The characteristic vegetation at Highrolls, where most of my observations were made, was typical mountain pinyon and cedar.

In and about Fresnal Canyon, rocks and logs were continuously used by them as elevated spots on which to sun themselves. They were observed to sit with hardly a movement for more than half an hour at a time.

In the orchard region at Highrolls the squirrels are decided pests, and many efforts have been made to decrease their abundance with but little result, on account of the rapid extermination by man of the predatory mammals in this region.

From shortly after sunrise until ten o'clock and from three in the afternoon until just before sundown they were seen to be most active, though there was hardly a time in the day when one could not be seen.

The stomach contents of five adults taken at Highrolls were examined. In all of these the stomach was full but the food so well chewed for the most part that identification of the bulk was impossible. The greater part of the food was vegetable but chitinous parts of insects were found and the hind wings of a beetle were identified as belonging to the genus *Lucanus*, having almost exact correspondence in venation with *Lucanus dama*. An earthworm of the family Lumbricidae was taken practically entire from one of the stomachs. From the cheek pouches of one specimen, taken late in the afternoon, 55 juniper berries identified as *Juniperus scopulorun* were taken. Certain wild flowers are apparently relished by them, as flowers were identified from the cheek pouches as those of rabbit brush *Chrysothamnus*, and other flowers were taken that are not yet identified.

Half-grown young were observed on June 29 and during the middle and latter parts of July. A female taken on July 19 contained five embryos. One might infer from this that they have two litters a year.

All of the stomachs were infested with nematodes of the family Ascaridae. Fleas, probably of the genus *Ceratophyllus*, were found on all of the specimens examined.

Eleven squirrels taken July 20, 21, and 22, at Highrolls, were all in the middle of molting. These rock squirrels molt from the anterior part backwards. The molting had progressed to approximately the same stage in the young as in the adults. The new, light gray fur extended about half-way down the dorsal surface and was wiry in texture. The old fur was brown-yellow in color and softer haired than the new.—ROBERT M. BRADLEY, *Museum of Zoology, Ann Arbor, Michigan.*

CARNIVOROUS HABIT OF THE EUROPEAN HARE

William Hymers of Drumbo, Ontario, in March, 1928, told me of going hare-hunting during the past winter and seeing what he supposed was a hare crouching at some distance away. As he approached it did not rise, and eventually it proved to be the body of a cottontail rabbit, which had been apparently killed by a hare. The tracks in the snow were plain and showed no hint that anything had been there except the hare, as its tracks were the only ones going to the rabbit and the only tracks going away from it. It was evident that the hare had caught the rabbit after a short chase and killed it by biting it in the neck and head. Mr. Hymers tells me that another hunter near Drumbo has seen several rabbits that had been killed by hares, but they were never eaten, just killed and left there.—W. E. Saunders, *London, Ontario.*

BISON IN COLORADO

The following notes are supplemental to those of Warren (Journ. Mammalogy, vol. 8, p. 60, Feb., 1927) relating to the occurrence of buffalos on the western slope of Colorado.

I hunted, in 1894, in California Park (at the headwaters of Elk Creek, a tributary of the Yampa River) with an "old timer," Melvin by name, who had killed buffalos on the plains for meat and pelts; he moved over to the wilder western slope of Colorado when his game on the eastern side was gone. He told me repeatedly that bison were not uncommon in all the "parks" and along the river bottoms from Meeker to the Wyoming line, and east to the Continental Divide. The correctness of this statement is borne out by a recent communication of Chauncy Thomas (Colorado Magazine, Denver, April, 1928, p. 54), who says in the course of a sketch on buffalo hunting that "There were a few (buffalos) in Middle Park, at the head of the Troublesome, when I hunted in there from 1886 to 1891, but we left them alone. It meant almost a lynching to molest them."

My own experiences also bear out Melvin's accounts, for I myself have found buffalo skulls or horns in the following localities: Mud Springs (about 25 miles north of Rifle), on the top of Book Cliffs, on the Divide between Piecance and Rifle Creeks, in California Park, in Lost Park (near Marvine Lake), and on the high hills north of, and above, Glenwood Springs. It is patent, judging by Warren's and my own notes, that buffalos were widely distributed over the western slope of Colorado, and probably fairly abundant.—W. H. Bergtold, *Denver, Colorado.*

STONES FROM THE STOMACH OF A GUANACO

Two stones, found in the stomach of the guanaco (*Lama huanacus*), were given to me by an Araucanian Indian, who came from the region north of Lake Nahuelhuapi, Argentina. He told me that such stones were fairly common in some sections of the country in the stomachs of the adult animals. The Indian name for the concretions is "luan kura," which means guanaco stone.

The smaller stone, which has been broken across, has a small stick in the center around which concentric layers of the stone can plainly be seen. The larger concretion measures 33 by 29 mm. The cross section at right angles to the long axis is practically circular. The circumference around the thickest part is 93 mm.

The stone weighs 32.1 grams. The outside color is a dirty yellowish gray; inside it is somewhat paler. The entire outside is, naturally, very highly polished.

Great medicinal value is attached to these stones by both the Indians and the country people in general.[1] They grind them into a fine powder which is taken in small doses for stomach trouble, especially chronic complaints. The stones are hardly worth their weight in gold, but a native medicine woman would gladly trade a sheep for a stone like the larger one. The natives will explain to the uninformed that these stones came from the stomach of the guanaco and that as the animal was perfectly healthy the stones might have helped it and in some way warded off diseases that might have affected the stomach. "This is one of Nature's remedies given to the animal to protect it" is what they tell you. Because it was good for the guanaco and warded off diseases of its stomach, then it naturally follows that it is an excellent remedy for the ailments of human stomachs.—D. S. Bullock, *Angol, Chile.*

THE WHITE WHALE AT IPSWICH, MASSACHUSETTS

On June 8, 1928, from the beach at Ipswich, Dr. John B. May and I saw two white whales (*Delphinapterus leucas*). They kept close together, often broaching at the same time, showing their glistening white backs and occasionally a spout of spray which could be seen as they rose to the surface. They swam nearly the whole length of the beach from the mouth of the Essex to the mouth of the Ipswich River. When last seen, they were returning on their course. At their nearest approach, some two hundred yards away, we could plainly see their smooth rounded heads and backs, and could follow their course for a short way in the clear, shallow water.

On November 13, 1904, I saw one of these animals off Rockport, Cape Ann, and recorded it in "The Birds of Essex County," 1905, p. 13.—Charles W. Townsend, *Ipswich, Massachusetts.*

PREOCCUPIED NAMES

My attention has been called through courtesy of Dr. T. S. Palmer and Dr. G. G. Simpson to the preoccupation of two names proposed for fossil mammals by Walter Granger and myself.

Stehlinius Matthew, Amer. Mus. Novitates no. 14, Sept. 7, 1921, is preoccupied by *Stehlinia* Revilliod, Comptes Rendus Soc. Phys. Hist. Nat. Genève, vol. 36, no. 3, p. 94, December, 1919. **Stehlinella** is hereby proposed to take its place.

Palaeolestes Matthew and Granger, Bull. Amer. Mus. Nat. Hist., vol. 38, p. 576, December, 1918, type *Diacodon puercensis*, is preoccupied by *Palaeolestes* DeVis (an extinct bird), 1911, Ann. Queensland Mus., vol. 10, p. 15. **Prodiacodon** is hereby proposed to take its place.—W. D. Matthew, *University of California, Berkeley, California.*

[1] Similar concretions are occasionally found in the stomachs of most of the ruminants, and the notion of their magic healing-power is wide spread.—*Editor.*

RECENT LITERATURE

Burnham, John B. THE RIM OF MYSTERY—A HUNTER'S WANDERINGS IN UNKNOWN SIBERIAN ASIA. New York: G. P. Putnam's Sons. 8vo., pp. xv + 281, 60 illus., map. Cloth $3.50. 1929.

For about fifteen years I had tried to interest some sportsman in a hunting expedition to the eastern peninsula of Asia, lying just across Bering Strait from Alaska, in order to solve the interesting problem of the identity of the mountian sheep living there, of which meager information came from time to time, and also to gain some definite knowledge of the other wild life in that almost unknown region. In 1921, John B. Burnham undertook this adventurous task and under the most adverse conditions succeeded in procuring a complete specimen of an adult ewe and some skulls of a sheep that was already on the verge of extinction. When the reviewer visited that region on the *Corwin* in 1881, guns were almost unknown among the natives, especially among the Chukchi who carried long-bladed spears to protect themselves and their herds of reindeer. Since then traders have supplied them with an abundance of guns and ammunition with the result that the native caribou have probably gone and the mountain sheep and big bears are approaching comparatively early extinction. By securing the precious specimens of mountain sheep, which he brought back and generously presented to the U. S. Biological Survey, Mr. Burnham has made an invaluable contribution to science. The specimens show conclusively that the sheep of extreme eastern Asia is a very close relative of the white *Ovis dalli* of Alaska and connects this species with the sheep of Kamschatka and of all of northeastern Siberia, including *Ovis borealis*. The skulls of the sheep from Chukchi Land are remarkably close to those of *O. dalli* in their characteristic features.

It is to be hoped that specimens of the big bears, the presence of which Burnham noted, may be obtained before they become extinct as none is known to be in any museum, and the establishment of their relationship to the grizzly bears of northwestern Alaska is of great scientific interest.

Owing to unavoidable conditions Mr. Burnham was forced to leave these hunting grounds soon after he reached the mountains about the head of Holy Cross Bay, where opportunities to secure sheep and possibly bears appeared more promising than at other points he visited.

The observations made of herds of walruses passing the summer along the rocky coast from Providence Harbor to Holy Cross Bay appear to establish a record of the only surviving herds of these animals living entirely south of Bering Straits, where in former days they were numerous as far south in summer as the Fur Seal Islands and the north shore of the Alaska Peninsula.

The author mentions the scarcity of life in the rugged mountainous border of the south coast of the Chukotsk Peninsula where he saw a few ravens, rock ptarmigans, and Lapland longspurs. The record of two hares is interesting, as they were undoubtedly the form of Arctic hare known as *Lepus tschuktschorum* described and known only from a single skull from the coast of Mechigme Bay in the U. S. National Museum.

Although the region visited proved to be extremely poor in animal life, yet all records the author made of the species encountered and the physical character of the region are of great interest and value, coming as they do from a region so little known. It is very desirable that a longer and more detailed survey of the animal and plant life of this region be made before more of the original fauna disappears,

for here we have close relatives of many species that must have come to America across the land bridge that once connected the two continents in this region.

Aside from the scientific importance of the observations recorded in this book, the author has given an entertaining account of the people that he encountered, including the adventurers of various nationalities engaged in the fur trade, sometimes almost piratical in character, the Americans of Nome, the Bolsheviks of eastern Siberia, and the Eskimos and Chukchi of the Chukotsk Peninsula. It is a remarkably varied and interesting account of a notable hunting expedition which opens up to the reader a new country with its strange people, both civilized and uncivilized, and their equally strange modes of life.—E. W. Nelson.

Abbott, Clinton G. Museum work in California. Nature Mag., vol. 12, pp. 244 and 269, illus. October, 1928.

Achten, L. La protection de la faune au Kasai (Congo, Belge). Annales Comité Belge pour la Protection de la Nature, vol. 1, year 1926, pp. 63–68, illus. 1928.

Ali, Salim A. Stalking big game with a camera in equatorial Africa; with a monograph on the African elephant, by Marius Maxwell. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 571–573. January 15, 1928. (A review.)

——— A unique lion photograph. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 583–584, 1 pl. January 15, 1928.

Allen, Edgar. Precocious sexual development from anterior hypophysis implants in a monkey. Anat. Rec., vol. 39, pp. 315–323, illus. August 25, 1928. (Experiments on *Macacus rhesus*.)

Allen, Glover M. Whales and whaling in New England. Sci. Monthly, vol. 27, pp. 340–343. October, 1928.

Anderson, R. M. [Review of Taylor and Shaw's mammals and birds of Mount Rainier National Park.] Canadian Field-Nat., vol. 42, no. 7, pp. 180–182. October, 1928.

——— The fluctuation in the population of wild mammals, and the relationship of this fluctuation to conservation. Canadian Field-Nat., vol. 42, pp. 189–191. November 1, 1928.

Anthony, H. E. To the arctic for walrus. Nat. Hist., vol. 29, pp. 50–64, illus. February, 1929.

Arnault, [?]. Un prétendu hybride du chien kabyle et du renard. Bull. Soc. Nat. Acclimatation France, vol. 73, pp. 203–205. 1926. (Discredits the supposed hybrid.)

Arthur, Stanley C. The fur animals of Louisiana. Bull. no. 18, Dept. Conservation State of Louisiana, pp. 1–433, illus. November, 1928. (A well written, interesting and valuable contribution to the subject. Contains much historical material as well as economic and commercial. Gives accounts of the natural history of the opossum, raccoon, mink, weasel, otter, skunk, spotted skunk, wild cat, wolf, gray fox, beaver, and muskrat, the last in much detail.)

Ashbrook, Frank G. Production and conservation of fur animals. Game Breeder, vol. 22, pp. 337–343. November, 1928.

——— Recommendations to beginners in fur farming. U. S. Dept. Agric. Leaflet no. 27, pp. 1–6. November, 1928.

ASHBROOK, FRANK G., AND KARL B. HANSON. Progress report of marten breeding experiments. Northern Fur Trade, vol. 3, no. 9, pp. 14–16. November, 1928.

——— A comparison of feed costs with pelt values of silver foxes. Fur Journ., vol. 2, no. 11, pp. 24–25. December, 1928.

ASHBROOK, FRANK G., AND HORACE J. MCMULLEN. Fur bearing animals of the United States. The coyote. Fur Journ., vol. 2, no. 9, pp. 18, 59–60, illus. October, 1928.

——— Fur bearing animals of the United States. The wild cat. Fur Journ., vol. 2, no. 10, pp. 12, 35, and 41, illus. November, 1928.

——— Fur bearing animals of the United States. The couguar. Fur Journ., vol. 2, no. 11, pp. 36–37, 62, illus. December, 1928.

ASTRE, GASTON. Le Brachyodus porcinus de Briatexte et les caractères de la mandibule des petites brachyodes oligocènes Bull. Soc. Hist. Nat. Toulouse, vol. 54, pp. 327–334, pls. 2, 1926.

——— Sur une variation du crâne facial de l'ours des cavernes. Bull. Soc. Hist. Nat. Toulouse, vol. 54, pp. 371–376, illus. 1926.

——— Faune quarternaire de Gourdon à Ursus arctos. Bull. Soc. Hist. Nat. Toulouse, vol. 54, pp. 389–393. 1926. (Lists *Sus scrofa*, *Cervus tarandus*, *C. elephas*, *Elephas primigenius*, and *Ursus arctos*.)

AUGER, L. Recherches sur l'utilisation des aliments activés en pathologie animale et en zootechnie. Comptes Rendus Séances Soc. Biol., Paris, vol. 98, pp. 972–973. April 17, 1928.

BAKER, DAN D. Absorption from the vagina of the albino rat at various periods of the oestrous cycle. Anat. Rec., vol. 39, pp. 339–341. August 25, 1928.

BALDUZZI, O. Il tractus tecto-cerebellaris nei mammiferi. Riv. Pat. Nerv. e Ment., vol. 31, pp. 513–517, pls. 4. 1926.

BARNES, WILL C. Rabbit fever or tularemia. Sci. Monthly, vol. 27, pp. 463–469. November, 1928.

B[ARRETT], C[HAS.] Behaviour of young Echidna. Victorian Naturalist, vol. 45, no. 5, p. 146. September, 1928.

BASSET, J., AND E. CAILLOT. Streptotricose pulmonaire épizootique des porcelets. Comptes Rendus Séances Soc. Biol., Paris, vol. 98, pp. 976–977. April 17, 1928.

BATTEN, H. MORTIMER. Stags fighting to a finish. Field [London], vol. 152, p. 955, illus. December 13, 1928.

——— A stoat's strange conduct. Attacking a horse and a donkey. Field [London], vol. 153, p. 73. January 10, 1929.

BELL, W. B. Alaska's reindeer-caribou. Amer. Forests and Forest Life, vol. 35, no. 1, pp. 17–20, illus. January, 1929.

BELLOCQ, PHILIPPE. Sur quelques particularités de la région du temporal chez le chien. Comptes Rendus Soc. Biol., vol. 96, pp. 991–994, illus. 1927.

BETTERTON, F. A. A tiger as a pet. Field [London], vol. 152, p. 705, illus. November 1, 1928.

BOAS, H. A. Noosing tigers. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 790. May 31, 1928.

BOOTH, C. H. Mink breeding. Amer. Fur Breeder, vol. 1, no. 1, pp. 4–5; no. 2, pp. 6–7. 1928.

Booth, H. B. A precocious young otter. Naturalist [London], no. 862, p. 324. November, 1928.

Bor, N. L. Musth in elephant. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 594–596. January 15, 1928.

Boubier, Maurice. Histoire de la réintroduction du bouquetin dans les Alpes suisses. Bull. Soc. Zool. Génève, vol. 3, pp. 68–75, 1927.

Brander, A. A. Dunbar. How wild dogs kill their prey. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 591–592. January 15, 1928.

Brinkmann, Aug. Langøret flaggermus med unge. Naturen [Bergen], vol. 53, pp. 27–28, illus. January, 1929. (Young *Plecotus* nursing while still attached by umbilical cord.)

Broch, Hj. Bisamratten i Europa. Naturen [Bergen], vol. 53, pp. 1–8, January, 1929. (Account, with map of the spread of the muskrat in Europe from 1906 to 1921.)

Brownlow, A. A clouded leopard (Felis nebulosa) attacking man. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 789–790, 1 pl. May 31, 1928.

Brunskill, B. A. S. A panther and flashlight. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 588, 1 pl. January 15, 1928.

Bryant, Harold C. Sierra marmot at Merced Lake. Yosemite Nature Notes, vol. 7, p. 54. July 1928.

Buresch, Iw. Die Naturwissenschaftlichen Institute seiner Majestät des Königs der Bulgaren. Mitteilungen Königl. Naturwissenschaft. Inst. in Sofia, Bulgarien, vol. 1, pp. 1–16, illus. 1928.

Cabrera, Ángel. Las formas geográphicas de Aethechinus algirus. Bol. Real Soc. Española Hist. Nat., vol. 28, pp. 453–455. 1928. (New: *A. a. lavaudeni*.)

Calvert, J. F., and J. H. Cameron. Zoology for high schools. 12 mo., pp. viii +344, illus. Toronto: Educational Book Co. October, 1928. (An elementary text book of zoology with about 80 pages devoted to mammals.)

Carey, Henry R. Shall the steel trap be outlawed? Sportsman, vol. 5, no. 2, pp. 49–51, illus. February, 1929. (Contended as an unenforceable law. In order to save our fur-bearers it is recommended that women "everywhere take the pledge not to buy, sell, wear, or use any animal furs whatsoever, unless they are duly identified as having been ranch or farm raised, and there instantly and painlessly killed, or else humanely destroyed outside the farm without use of the steel trap in any form.")

Carmel, A. Gerson. An inquiry into the phylogenetic basis of the flexuous arteria carotis interna of man (the arteriae carotides of the seal). Anat. Rec., vol. 39, pp. 343–347, illus. August 25, 1928. (Curvatures or flexuosity were not found in the A. carotis communis, interna, or externa in any of ten specimens of *Callorhinus alascanus*.)

Cave, F. O. Unusual behavior of a tigress with live bait. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 587, illus. January 15, 1928.

Chang, H. T. On the question of the existence of elephants and rhinoceros in north China in historical times. Bull. Geol. Soc. China, vol. 5, pp. 99–106. 1926.

Christie (Miss). Albino moles. Scottish Naturalist, no. 172, p. 125. August, 1928.

Clapham, R. Agility of squirrels. Field [London], vol. 153, p. 25. January 3, 1929.

CLARK, AUSTIN H. Animal evolution. Quart. Rev. Biol., vol. 3, pp. 523–541. December, 1928. (A revival of the saltation theory. The evidence brought forward from mammals does not support the author's conclusions.)

CLAWSON, A. B. Normal rectal temperatures of sheep. Amer. Journ. Physiol., vol. 85, pp. 251–270. June, 1928.

CLIVE, J. McC. A tussle between tiger and buffalo bait. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 586. January 15, 1928.

——— Circumstantial account of a panther attacked by wild dogs. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 590. January 15, 1928.

COVELL, W. P. A microscopic study of pancreatic secretion in the living animal. Anat. Rec., vol. 40, pp. 213–223, illus. October 25, 1928. (Experiments on mice.)

DE BEER, G. R. Vertebrate zoology. 8vo, xx +505 pp., 185 text figs. New York: Macmillan Company. Cloth, $5.50. 1928. (A good text-book for college use. It is divided into four major parts; the first treats of morphological types illustrating the different stages of organization and the trend of vertebrate evolution; the second deals with embryological types that illustrate the different modes of development; the third considers the comparative zoology of the chordates, with an outline classification of the main groups; the fourth part discusses evolution. The rabbit is used as a mammalian type. There is a chapter on the evolution of the Mammalia, and one on the evolution of primates and man.)

DERSCHEID, J. M. Notes additionelles sur les chiens sauvages de l'Afrique centrale. Rev. Zool. Africaine, vol. 14, no. 2, pp. 3–8, illus. 1926.

DICE, LEE R. Division of Mammals. Report of the Director of the Museum of Zoology to the Board of Regents, Univ. Michigan Official Publ., vol. 30, no. 16, pp. 16–18. 1928.

DYMOND, J. R. The mammals of the Lake Nipigon region. Trans. Royal Canadian Inst., vol. 16, part 2, pp. 239–250. 1928.

——— The present range of the European hare in Ontario. Canadian Field-Nat., vol. 42, p. 95. May 31, 1928.

EHRENBERG, K. Über Epiphysenbildungen am Hinterhaupte und an den beiden atypischen Halswirbeln des Höhlenbären und anderer Säugetiere. Pälaeon. Zeitschr., vol. 8, pp. 54–61. 1926.

ERWIN, M. E. Artistic and practical raccoon enclosure at Tulsa. Parks and Recreation, vol. 12, pp. 98–100, illus. December, 1928.

ESTINSON, G. J. Breeding mink. Amer. Fur Breeder, vol. 1, no. 4, pp. 16–18, illus. October, 1928.

FAUNTHORPE, J. C. Wild dogs. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 590. January 15, 1928.

FINLEY, WILLIAM L. Riding the rim rocks. Nature Mag., vol. 12, pp. 149–154, illus. September, 1928. (Photographing prong-horn antelopes.)

FLEROV, C. Sur les caractères diagnostiques du genre Capreolus Frisch. Comptes Rendus Acad. Sci. Union Socialistic Soviet Republics, 1928, pp. 479–484. 1928. (In Russian, with diagnoses of species and subspecies in English. Recognizes two species, one of five subspecies.)

——— Preliminary note on the diagnostic characters of the genus Moschus Linné. Comptes Rendus Acad. Sci. Union Socialistic Soviet Republics,

1928, pp. 515–519. 1928. (Recognizes eight forms. New: *M. moschiferus arcticus*, *M. m. sachalinensis*, and *M. berezovskii*.)

FORTUNE, R. Alpine hare in Lancashire. Naturalist [London], no. 859, pp. 235–236. August, 1928.

GOLDMAN, E. A. Three new rodents from western Arizona. Proc. Biol. Soc. Washington, vol. 41, pp. 203–206. December 18, 1928. (New: *Thomomys fulvus suboles*, *Perognathus baileyi domensis*, and *Sigmodon hispidus plenus*.)

GOURDON, MAURICE. Note sur l'izard des Pyrénées. Bull. Soc. Sci. Ouest France [Mantes], ser. 4, vol. 7, pp. 35–40. 1927.

GREEN, MORRIS M. Concerning some shrews of the mainland of southwestern British Columbia. Canadian Field-Nat., vol. 42, pp. 165–166. October, 1928. (Notes on six species.)

HACK, DOROTHY. The diet of "wild deer." Yosemite Nature Notes, vol. 7, p. 69. August, 1928.

HANSEN, GEORGE H. Hairy mammoth skeleton in Utah. Science, n. s., vol. 68, p. 621. December 21, 1928.

HANSON, KARL B. Lungworm trouble in foxes—its treatment and control. Amer. Fur Breeder, vol. 1, no. 6, pp. 16–17. December, 1928.

HARTMAN, CARL G. A readily detectable sign of ovulation in the monkey. Science, n. s., vol. 68, pp. 452–453. November 9, 1928.

HAY, OLIVER P. A collection of pleistocene vertebrates from southwestern Texas. Proc. U. S. Nat. Mus., vol. 68, art. 24, pp. 1–18, pls. 8. 1926. (New genus: *Neochoerus*, the genotype, *Hydrochoerus pinkneyi*. New species: *Camelops aransas*, *Anancus orarius*, and *A. defloccatus*.)

HEADSTROM, BIRGER R. An ancient walrus skull. Science, n. s., vol. 67, p. 608. June 15, 1928.

HERRICK, EARL H. The duration of pregnancy in guinea-pigs after removal and also after transplantation of the ovaries. Anat. Rec., vol. 39, pp. 193–200. July 25, 1928.

HICKS, ROBERT A. Blood relationship within the order Rodentia. Science, n. s., vol. 69, pp. 190–191. February 15, 1929.

HIGGINS, GEORGE M., AND GEORGE T. MURPHY. The phagocytic cells (v. Kupffer) in the liver of common laboratory animals. Anat. Rec., vol. 40, pp. 15–39, illus. September 25, 1928.

HOME, W. M. LOGAN. Readers' views on 'Game preservation in India.' Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 581–583. January 15, 1928.

——— What is the record panther? Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 587–588. January 15, 1928.

——— Boldness of panthers. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 588–589. January 15, 1928.

——— The bray of the chital stag. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 594. January 15, 1928.

HORSFALL, CARRA E. Some bear facts. Nature Mag., vol. 12, pp. 145–146, col. illus. September, 1928.

——— Our world cats. Nature Mag., vol. 12, pp. 353–354, col. illus. December, 1928.

HOWELL, A. BRAZIER. Contribution to the comparative anatomy of the eared and earless seals (genera Zalophus and Phoca). Proc. U. S. Nat. Mus., vol. 73, art. 15, pp. 1–142, pl. 1. January 26, 1929.

HOWELL, ARTHUR H. Descriptions of six new North American ground squirrels. Proc. Biol. Soc. Washington, vol. 41, pp. 211–214. December 18, 1928. (New: *Citellus townsendii brunneus, C. elegans nevadensis, C. columbianus ruficaudus, C. spilosoma pallescens, C. tridecemlineatus arenicola,* and *C. t. monticola.*)

HUEY, LAURENCE M. A new pocket gopher and a new antelope ground squirrel from Lower California, Mexico. Trans. San Diego Soc. Nat. Hist., vol. 5, no. 15, pp. 241–244. February 27, 1929. (New: *Thomomys bottae cactophilus* and *Ammospermophilus leucurus canfieldae.*)

IL'IN, N. A. Seasonal dimorphism in the color of the arctic fox [trans. title]. Trans. Lab. Exper. Biol. Zool. Park Moscow, vol. 2, pp. 239–250, illus. 1926. (In Russian, with German résumé.)

JARDINE, W. M. Control of predatory animals. Letter from the Secretary of Agriculture transmitting report on investigations made by the Department of Agriculture as to the feasibility of a ten-year coöperative program for the control of predatory animals within the United States. 70th Congress, 2nd Session, House Doc. no. 496, pp. 1–17. January 3, 1929.

JOHN, A. W. A large tusker elephant. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 596. January 15, 1928. (Tusks weighed 85 lbs. and 86 lbs.)

——— A good Nilgiri tahr (Hemitragus hylocrius). Journ. Bombay Nat. Hist. Soc., vol. 32, p. 597. January 15, 1927.

KEY, J. ALBERT. Cytology of the synovial fluid of normal joints. Anat. Rec., vol. 40, pp. 193–211, illus. October 25, 1928. (Experiments on rabbits.)

[KROLL, BEN.] Antelope repel coyote attack. Fur Journ., vol. 2, no. 9, p. 26. October, 1928. (Reprint from "The Service," Amer. Game Protective Assoc., July, 1928.)

LACOSTE, A., AND A. BAUDRIMONT. Structure des artères pulmonaires du dauphin (Delphinus delphis). Comptes Rendus Séances Soc. Biol., Paris, vol. 94, pp. 1148–1149. 1926.

——— Recherches sur le développement de l'occipital des mammifères. Nouvelles observations sur l'évolution embryologique de l'écaille occipitale de l'homme. Comptes Rendus Séances Soc. Biol., Paris, vol. 98, pp. 955–957. April 17, 1928.

LAURIE, A. S. An elephant with extraordinary 'glands.' Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 792–793, 1 pl. May 31, 1928. (Two gland-like growths on the neck.)

LEA, HERMANN. A story of a grey fox. Field [London], vol. 152, p. 1040. December 27, 1928. (Brief notes on habits of a grey phase of the English red fox.)

LESNÉ, E., AND G. DREYFUS-SÉE. Sélection d'espèces animales a caractères selon les lois mendéliennes et modifications durables obtenues par des vaccinations répétées. Comptes Rendus Séances Soc. Biol., Paris, vol. 98, pp. 922–924. April 17, 1928.

LEURET, E., AND J. CAUSSIMON. Action du bacille bilié de Calmette (BCG) chez le cobaye, par voie intrapéritonéale et intra-veineuse. Comptes Rendus Séances Soc. Biol., Paris, vol. 98, pp. 952–954. April 17, 1928.

LÖNNBERG, EINAR. Some remarks on a skeleton of Inia geoffrensis Blainv. Arkiv för Zool., vol. 20A, no. 11, pp. 1–3, pl. 1. December 19, 1928.

MACGILLIVRAY, JAMES. Mickey the beaver. Nat. Geog. Mag., vol. 54, pp. 741–756, illus. December, 1928. (Notes on beaver in northern Michigan.)

MACMILLAN, RUTH E. The so-called hemal nodes of the white rat, guinea-pig, and sheep: A study of their occurrence, structure, and significance. Anat. Rec., vol. 39, pp. 155–175, illus. July 25, 1928.

MATTHEW, W. D. The ape-man of Java. Nat. Hist., vol. 28, pp. 577–588, illus. December, 1928.

MAURIAC, P., E. AUBERTIN, AND E. AUBEL. Sur la vitesse des processus d'oxydo-réduction produits par les cellules de mammifères (tissus normaux adultes). Comptes Rendus Séances Soc. Biol., Paris, vol. 98, pp. 959–960. April 17, 1928. (Experiments in the guinea pig, rabbit, and dog.)

MAXWELL, MARIUS. The home of the eastern gorilla. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 436–449, pls. 10, map. January, 1928.

MCCALMONT, DERMOT. Pine marten in Ireland. Field [London], vol. 153, p. 73. January 10, 1929.

MCCANN, C. The record four-horned antelope (Tetraceros quadricornis). Journ Bombay Nat. Hist. Soc., vol. 32, pp. 592–593, illus. January 15, 1928.

——— Reply to Mr. Phillips' note on p. 371, vol. XXXII re colour of the long-armed sheath-tailed bat (Taphozous longimanus). Journ. Bombay Nat. Hist. Soc., vol. 32, p. 791. May 31, 1928.

MCKINLAY, A. A lesson in nature. Amer. Fur Breeder, vol. 1, no. 6, p. 20, illus. December, 1928. (Muskrat with overgrown incisors.)

MEARS, C. E. D. Birth of freak calf at Indore. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 597–598, illus. January 15, 1928. (Calf with bifurcated head.)

MILLER, GERRIT S., JR. The gums of the porpoise Phocoenoides dalli (True). Proc. U. S. Nat. Mus., vol. 74, art. 26, pp. 1–4, 4 pls. January 26, 1929.

MILLS, EDWARD S. The vascular arrangement of the mammalian spleen. Quart. Rev. Exper. Physiol., vol. 16, pp. 301–319, illus. 1927.

MOFFAT, C. B. The brown rat. Irish Naturalists' Journ., vol. 2, no. 5, pp. 87–89. September, 1928.

MORRIS, RALPH C. Habits of the porcupine. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 791–792. May 31, 1928.

——— On 'Natural deaths' in wild elephants. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 794–795. May 31, 1928.

MORRISON, N. Rats and poison. Field [London], vol. 153, p. 152. January 24, 1929.

——— The rat as a mechanic. Field [London], vol. 153, p. 152. January 24, 1929.

OGNEV, S. I. Zur Frage über die systematische Stellung einiger Vertreter der Gattung Paraëchinus Trouessart. Zool. Anzieger, vol. 69. pp. 209–218, illus. 1927.

ONEAL, C. H. Troubles of a chickaree family. Yosemite Nature Notes, vol. 7, p. 68. August, 1928.

OSBORN, HENRY FAIRFIELD. Protection of the big game in the Belgian Congo.

Annales Comité Belge pour la Protection de la Nature, vol. 1, year 1926, pp. 58–62, illus. 1928.

——— The revival of central Asiatic life. Nat. Hist., vol. 29, pp. 3–16, illus. February, 1929.

——— Note on the geologic age of Pithecanthropus and Eoanthropus. Science, n. s., vol. 69, pp. 216–217. February 22, 1929.

Osmaston, B. B. Clicking noise made by muntjac. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 795. May 31, 1928.

Pack, Arthur Newton. A question of taste. Nature Mag., vol. 13, pp. 147–151, illus. March, 1929. (Popular account of mammals that visited a mineral lick.)

Pack-Beresford, R. Hares going to ground. Irish Naturalists' Journ., vol. 2, no. 5, p. 104. September, 1928.

Pederson, Alwin. Beiträge zur Kenntnis der Säugetier- und Vogelfauna der Ostküste Grönlands. Meddelel. om Grönland, vol. 68, pp. 150–250, illus. 1926.

Pickwell, Gayle. Weasel-wise. Nature Mag., vol. 13, pp. 32–34, illus. January, 1929. (Very popular account of weasels.)

Pike, H. E. The story of a hyena. Field [London], vol. 152, p. 1009, illus. December 20, 1928.

Piroutet, M. Sur la découvert d'ossements de marmottes à La Chatelaine (Jura). C. R. sommaire des séances de la Soc. Géol. de France, 1927, pp. 207–208. 1927. (The bones were found in ancient burrows dug in the face of a moraine of Rissian age).

Pocock, R. I. The langurs or leaf monkeys of British Indian. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 472–504, 660–677, pls. 4 (1 col.), many text figs. 1928. (New: *Pithecus entellus achilles*, *P. e. ajax*, *P. e. hector*, *P. e. achates*, *P. e. iulus*, *P. e. aeneas*, *P. e. elissa*, *P. e. priamellus*, and *P. pyrrhus atrior*.)

Pope, Philip H. Isopropyl alcohol as a preservative. Science, n. s., vol. 68, pp. 487–489. November 16, 1928.

Preble, Edward A. California's mammals—past and present. Nature Mag., vol. 12, pp. 259–261, 275, illus. October, 1928.

Raven, H. C. Strange animals of the island continent. Nat. Hist., vol. 29, pp. 83–94, illus. February, 1929.

Riley, William A., and Reed O. Christenson. Reliable methods of growing tapeworms in foxes. Amer. Fur Breeder, vol. 1, no. 6, pp. 10–11, illus. December, 1928.

Risting, Sigurd. Whales and whale foetuses. Statistics of catch and measurements collected from the Norwegian Whalers Association 1922–25. Rapports et Procès-Verbaux des Réunions, Conseil Permanent International pour l'Exploration de la Mer [Copenhagen], vol. 50, pp. 122. December, 1928.

Robinson, F. B. White tigers. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 584–585, illus. January 15, 1928.

Russell, C. P. Old Horny's skull exhibited. Yosemite Nature Notes, vol. 7, p. 56. July, 1928. (Three-horned buck skull.)

——— A new mammal for Yosemite. Yosemite Nature Notes, vol. 7, p. 78. September, 1928. (Records the otter.)

RUSSELL, L. S. Breeding the black raccoon. Amer. Fur Breeder, vol. 1, no. 1, pp. 18–19. July, 1928.

SANDERSON, P. McD., S. H. PRATER, AND SALIM A. ALI. The truth about 'A unique lion photograph.' Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 788–789. May 31, 1928.

SANDERSON, W. E. Our debt to the fur bearer. Nature Mag., vol. 12, pp. 357–361, illus. December, 1928.

SANDGROUND, J. H. Some new cestode and nematode parasites from Tanganyika Territory. Proc. Boston Soc. Nat. Hist., vol. 39, no. 4, pp. 131–150, illus. 1928. (Several mammals mentioned among the hosts.)

SANDISON, J. C. A method for the microscopic study of the growth of transplanted bone in the transparent chamber of the rabbit's ear. Anat. Rec., vol. 40, pp. 41–49, illus. September 25, 1928.

SAUNDERS, W. E. Brewer mole in Ontario. Canadian Field-Nat., vol. 43, p. 42. February, 1929.

——— The smoky shrew at London, Ontario. Canadian Field-Nat., vol. 43, p. 42. February, 1929.

SCHWARTZ, BENJAMIN. A new species of trichostrongylid worm of the genus Cooperia from the carabao in the Philippine Islands, with a review of the genus. Proc. U. S. Nat. Mus., vol. 74, art. 20, pp. 1–5, pl. 1, 1928.

SCHWETZ, J. Les zèbres des Kundelungu et la protection de la faune dans le Haut-Katanga. Annales Comité Belge pour la Protection de la Nature, vol. 1, year 1926, pp. 63–68, illus. 1928.

SCOTT, H. HAROLD. Carcinoma of the tonsil in a common wolf (Canis lupus). Proc. Zool. Soc. London, 1928, pt. 1, pp. 43–47, pls. 1–3, April, 1928.

——— Report of deaths occurring in the society's gardens during the year 1927. Proc. Zool. Soc. London, 1928, pt. 1, pp. 81–119. April, 1928.

——— Tuberculosis in marsupials. Proc. Zool. Soc. London, 1928, pt. 1, pp. 249–256, pls. 1–3. April, 1928.

SINGH, SURAJMAL. Abnormal blackbuck and a good chinkara head from Bikanir. Journ. Bombay Nat. Hist. Soc., vol. 32, p. 593, illus. January 15, 1928.

SMITH, A. W. Elephants again. Atlantic Monthly, vol. 142, no. 5, pp. 633–642. November, 1928. (Notes on habits of Indian elephant, and protest against slaughter for sport.)

SNYDER, L. L. The mammals of the Lake Abitibi region. Univ. Toronto Studies, biol. ser. no. 32, pp. 7–15. 1928.

SOERGEL, W. Der Bär von Süssenbarn. Ein Beitrag zur näheren Kenntnis der diluvialen Bären. Neues Jahrb. Min., Geol., und Päläont. Abhandl., Abt. B, Beilage 54, pp. 115–156, pls. 14. 1926. (New: *Ursus süssenbornensis*.)

SOWERBY, A. DEC. Gazelle in Manchuria. China Journ., vol. 9, p. 258, illus. November, 1928.

——— The takin. China Journ., vol. 9, pp. 304–306, 1 pl. 1928.

STERNBERG, CHARLES H. Extinct animals of California. Scientific American, vol. 139, pp. 225–227, illus. September, 1928.

SUDBURY, Louise. What is the first fossil collected by man. Science, n. s., vol. 68, p. 135. August 10, 1928. (Specimen of the plant *Cycadeoidea etrusca*, not of the mammal *Elephas antiquus*.)

SWENSON, SIDEL B. Minnesota's muskrat resource. Fins, Feathers and Fur, nos. 66–67, pp. 259, 264. December, 1928.

——— The little warrier of the wilds. Fins, Feathers and Fur, no. 69, pp. 7, 15–16, illus. January, 1929. (Account of the mink.)

TEAL, RALPH. More notes on moving chickarees. Yosemite Nature Notes, vol. 7, p. 80. September, 1928.

TERRELL, CLYDE B. The qualifications of a good muskrat marsh. Amer. Fur Breeder, vol. 1, no. 1, pp. 6–7. July, 1928.

THEOBALD, CHARLES. Clicking noise made by muntjac. Journ. Bombay Nat. Hist. Soc., vol. 32, pp. 593–594. January 15, 1928.

THOMAS, OLDFIELD. The Delacour Exploration of French Indo-China.—Mammals. II. On the mammals collected during the winter of 1926–27. Proc. Zool. Soc. London, 1928, pt. 1, pp. 139–150. April, 1928. (Lists 68 forms, of which *Pipistrellus coromandrus tramatus* is new.)

TODOROWA, ZDRAWA. Die Entstehung der Grabanpassungen bei Talpa europaea. Gegenbaur's Morph. Jahrb., vol. 57, pp. 381–409, illus. 1927.

TURNAU, STEFAN. Sur la morphologie synthétique de la glande mammaire. Comptes Rendus Séances Soc. Biol., Paris, vol. 98, pp. 1051–1052. April 17, 1928. (Studies on *Bos taurus*.)

VON KORFF, CARLOS. La histogénesis de la substancia fundamental de la dentina de los mamiferos. Sem. Med. [Buenos Aires], vol. 34, pp. 311–313, illus. 1927.

WALLACE, FRANK. Deer forests in 1928: A review of the season. Field [London], vol. 153, pp. 19–22, illus. January 3, 1929. (Record of deer shot in British Isles.)

WILLIAMS, SAMUEL H. A river dolphin from Kartabo, Bartica District, British Guiana. Zoologica [publ. by New York Zool. Soc.], vol. 7, no. 4, pp. 105–128, illus. December 13, 1928. (Notes, mostly taxonomic and osteological, on *Sotalia guianensis*.)

WILKIE, H. C. The ossicula auditus of the common badger, Meles taxus. Proc. Zool. Soc. London, 1926, pt. 3, pp. 815–823, illus. 1926.

WOOD, ISAAC. Tame otters. Field [London], vol. 153, p. 73. January 10, 1929.

WOTHERSPOON, D. Mungoose in Clyde area. Scottish Naturalist, no. 172, p. 121. August, 1928.

WRIGHT, GEORGE M. A tick-infested deer. Yosemite Nature Notes, vol. 7, p. 38. May, 1928.

——— Baby elk arrive. Yosemite Nature Notes, vol. 7, p. 50. July, 1928. (Three calves added to Yosemite herd.)

ZECHES, R. F. Winter dens for raccoons. Amer. Fur Breeder, vol. 1, no. 6, p. 9. December, 1928.

ZUCKERMAN, S. Age-changes in the chimpanzee, with special reference to growth of brain, eruption of teeth, and estimation of age; with a note on the Taungs ape. Proc. Zool. Soc. London, 1928, pt. 1, pp. 1–42, pls. 1–4. April, 1928.

ELEVENTH ANNUAL MEETING OF THE AMERICAN SOCIETY OF MAMMALOGISTS

The eleventh annual meeting of the American Society of Mammalogists was held at the Museum of Zoology, University of Michigan, Ann Arbor, Michigan, from April 10 to 13, 1929, with about sixty members in attendance. The program comprised thirty-nine titles, two of which consisted largely of motion pictures.

PROGRAM

Tuesday, April 9

8.00 p.m.

Meeting of the Board of Directors at the Museums Building

Wednesday, April 10

9.00 a.m.

1. Address of welcome. A. G. Ruthven.
2. The last phase of the history of whaling. Remington Kellogg.
3. Breeding habits of Peromyscus. Arthur Svihla.
4. Breeding habits of Reithrodontomys. Mrs. Ruth D. Svihla.
5. Notes on the life history of a species of wood rat, Neotoma micropus canescens. H. W. Feldman.
6. The relations of small mammals to native Indians. Melvin R. Gilmore.
7. Methods of expressing relative abundance of mammals. Lee R. Dice.
8. The relation of color to environment in mammals. E. A. Goldman.

2.00 p.m.

9. Mammals on Biological Survey reservations. Ernest P. Walker.
10. The food and breeding habits of Blarina brevicauda. W. J. Hamilton, Jr.
11. Winter food of the eastern skunk. W. J. Hamilton, Jr.
12. Notes on the distribution and habits of the three-banded armadillo (Tolypeutes). Colin C. Sanborn.
13. Breeding habits of the Townsend mole. H. M. Wight.
14. In the shadow of the pole. R. M. Anderson. Motion pictures.

8.00 p.m.

The members and guests of the society inspected the laboratories and collections of the University Museums.

Thursday, April 11

9.00 a.m.

Program on mammalian genetics arranged by C. C. Little

15. Preliminary report on the genetic behavior of Mus faeroensis. C. C. Little.
16. Isolation and the fixation of minute variations. L. C. Strong.
17. Notes on inheritance in an interspecific cross in mice. C. V. Green.
18. Relation of precipitin reaction to taxonomy. R. A. Hicks.
19. A mendelian character which produces abnormal ears in the house mouse, Mus musculus. H. W. Feldman.

20. Factors underlying the fertility of mammals, with special reference to the genus Rattus. H. W. Feldman.
21. What constitutes a subspecies? Lee R. Dice.

2.00 p.m.

Program on mammalian parasitology arranged by G. R. LaRue

22. A bloodfluke of small native mammals. Helen Price.
23. The internal parasites of the muskrat. Donald Ameel.
24. The parasites of Michigan deer. G. R. LaRue.
25. Carnivores as reservoir hosts of the broad tapeworm of man in America. Teunis Vergeer.

3.30 p.m.

Annual business meeting of the society

6.30 p.m.

Annual dinner of the society

FRIDAY, APRIL 12

9.00 a.m.

26. The phylogeny of the Leporidae. Lee R. Dice.
27. Mastodonts of Indiana, with particular reference to recent excavations in that state. John H. Furbay.
28. A Pleistocene whale from Michigan. E. C. Case.
29. Juvenal modifications of the pterygoids in the squirrels. R. M. Bradley.
30. Some mechanical problems encountered by aquatic mammals. A. Brazier Howell.
31. Notes on the life history of the Dalles pocket gopher, Thomomys quadratus. H. M. Wight.
32. Studies of hibernation in Citellus tridecemlineatus (Mitchill). G. E. Johnson.
33. An unusual case of parturition—in the beaver. A. R. Shodle.

1.15 p.m.

Meeting of the directors

2.15 p.m.

34. White-tailed deer versus game management. J. J. Slauterback.
35. Mice in relation to the larch sawfly. S. A. Graham.
36. Destruction of wild life by automobiles. A. R. Shadle.
37. Devices for recording features of silver foxes. Ned Dearborn.
38. Color changes in Lepus americanus. Seymour Hadwen (presented by R. M. Anderson).

3.30 p.m.

Final business meeting of the society

8.15 p.m.

39. A cross-section through the Sudan. H. E. Anthony. (Lecture with motion pictures.)

SATURDAY, APRIL 13

9.30 a.m.

Members and their guests were escorted through the Department of Zoology, School of Forestry and Conservation, and to other places of interest on the campus of the university.

At the directors' and business meetings Dr. Witmer Stone was elected president, Drs. T. S. Palmer and Marcus Ward Lyon, Jr., vice-presidents, and other officers as listed on the front inside cover page of this issue of the JOURNAL. The resignation of Dr. Hartley H. T. Jackson as editor was presented, to take effect following the appearance of the final number of this volume of the JOURNAL, in November, and was regretfully accepted. E. A. Preble was appointed chairman of an editorial board of his own choosing to take over the editorship of the first number of volume eleven. In recognition of his achievements in the field of mammalogy Henry Fairfield Osborn was unanimously elected to honorary membership. Professor Osborn is thus the only American now living who has been the recipient of this honor.

H. E. Anthony officially reported that the Allen Memorial Fund had passed its goal of $10,000 during the past year. After a rising vote of thanks to the committee from the society, accompanied by hearty applause, the chairman instructed that the committee, consisting of Madison Grant, chairman, Henry Fairfield Osborn, Childs Frick, George Bird Grinnell, and H. E. Anthony, be dissolved, its purpose having been accomplished, and that the corresponding secretary transmit to them individually the sincerest thanks of the society for this great service which they have so unselfishly and so successfully rendered. This fund, added to our other invested resources, now places the society on a more solid financial foundation and the moral effect of its completion is even greater than will be the financial one. It is planned to use the interest from this fund to enlarge one number of the JOURNAL each year, this to be designated the Allen Memorial Number.

Appropriate resolutions were passed conveying to Dr. Clarence C. Little, president of the University of Michigan, Dr. Alexander G. Ruthven, director of the University of Museums, and to Dr. Lee R. Dice, chairmen, and other members of the local committee on arrangements, the thanks and appreciation of the society for the hospitality extended to it and the accomplishment of such a successful meeting.

During the past year a considerable portion of the time which the corresponding secretary was enabled to devote to the affairs of the society was occupied with the question of the proper conservation of whales, as he was directed to do at the tenth annual meeting. Efforts to maintain a healthy surplus of new members did not meet with great success for the reason that all but a few of the likely prospects for membership known to date had already been approached. During the coming year, however, it is confidently expected that there will be greater success in this direction because of activity of our new Committee on Membership, under the able chairmanship of William P. Harris, Jr.

As voted at the tenth meeting, our previous policy of allowing members one year's delinquency in their dues before cancellation of their journal subscription was abandoned because it was thought that this put an undesirable strain upon

our finances and was not good practice. Accordingly members were billed for their 1929 dues last October, and unless these were paid by the following first of February, their subscriptions were cancelled. Although this policy has had little or no financial effect upon the society it has reduced the mailing list of the JOURNAL by the total of the delinquents for two years, instead of one as heretofore. It is felt that this step will prove to have been a good one and will add to our sound condition.

A summary of the report of the corresponding secretary follows:

New members elected at the current meeting	72
New subscribers added since last meeting	20
Total new additions to the mailing list of the JOURNAL	92
Life members added since last meeting	3
Number of honorary members	3
Number of life members	59
Number of annual members	904
Total present membership	965
Members deceased since last meeting[1]	13
Resignations since last meeting	31
Dropped from membership for nonpayment of 1926 dues	23
Present mailing list of the JOURNAL	914
Number delinquent 1927 dues	33
Number delinquent 1928 dues	50
Number delinquent 1929 dues	56
Addresses unknown[2]	4

COMMENT AND NEWS

Information on the Syrian fauna is scattered and scarce. Your editor is indebted to Dr. W. L. Abbott for bringing to his attention the following account, "Wild Animals of the Holy Land," by Edward Thompson, published in the London Times Weekly, January 24, 1929:

"Palestine still had cheetahs when the War ended; they had been reported recently from almost every district, especially Carmel, Tabor, the Nazareth hills, Galilee generally, and wadis between Jerusalem and Jaffa. In the Druse villages of Carmel were skins procured during the War; the Tabor monks had seen them; Dr. Christie of Tiberias told me he had met them in the highlands west of the lake. In 1919 one pair existed even in Samaria, near Gerizim. But the leopard had only one certain locality, apart from the Jordan thickets—the hills by Ain-Jiddi. To-day I should be surprised to hear that either cheetah or leopard exists in the Holy Land, unless in the Jordan Valley.

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[1] Harry A. Cash, John S. Dexter, Jonathan Dwight, T. A. English, Maxwell Graham, W. F. Henninger, William P. Rauch, Robert Ridgway, Wirt Robinson, Charles Sheldon, Peter P. Sushkin, William L. Underwood, Harry L. White.

[2] Mrs. Edythe K. Eustace, Miss O. M. Andrews, Paul J. Trudel, James Critchell-Bullock.

"From Lebanon and Anti-Lebanon both went earlier. The cheetah was always rare in Western Syria; but, 50 years ago, the leopard was common. It is remembered as haunting the Bhowara pine-grove, near the fastness Colonel Churchill built 70 years ago, steep ravine before and cliff and scree behind; and the ilex and myrtle jungle round the ruined Druse *khalweh* above Aleih. Till recently it laired by the Damur river, near Sidon. Not far from Schweir, a summer resort under Jebel Sannin (8,600 ft., highest of the Southern Lebanon), a myrtle-choked cave is pointed out as formerly a leopard's den. The American University has a skin from the foothills where Lebanon breaks into Galilee. But, except that they are believed to linger along the rocky course of the Litani (Leontes), the Syrian leopards must be sought farther north, beyond Lebanon.

"What of the bears, that sub-species named Isabelline? My interest in them was a jest in Beirut in 1919, where my American friends were sceptical as to their survival. Did not their museum contain the last of the race, shot by a professor alleged to exist from summer to summer solely in the dream of shooting another? Nevertheless, Lebanon still has bears, though not Anti-Lebanon or Hermon. Sir Valentine Chirol told me of an experience, 50 years ago, with a bear that savaged his clothes at Bludan, in Anti-Lebanon. Bludan, as late as 1908, was a great place for bears. Not only were several shot by the American family that has done so well in extirpating the Syrian fauna; Scotland lent a hand, Dr. MacKinnon of Damascus secured pelts. The last Anti-Lebanon bear-tracks were seen in 1919. No one knows when Hermon lost its bears. When I climbed it a year ago, spending the night in lee of Pan's fallen temple on the summit, it was a mountain desolate of bird and beast.

"But bears are still on Sannin's vast craggy top, though another year or two will see their extermination. In 1919 I heard that mounted Australians chased one down in Coele-Syria, close to Sannin. The Zahleh people complained of ravaged vineyards, and one man told me he had taken a German officer up the mountain, where he had shot four bears. Such a bag amused the sceptics. But in 1927 no one disbelieved in the Sannin bears. At Neba Sannin, a widow living in an isolated orchard high up had stories enough of their depredations. She saw them every summer, and had the skin of one her husband had shot. Elsewhere, on the circuit of Sannin, I met men who had seen or shot them.

"The Palestine crocodile (which had two haunts, with a rumoured third one) survived into the present century, but is now extinct. Beirut still has its family of seals. In 1926 an otter was killed in the Dog river, apparently the first any European or American had seen in Southern Syria. Hyenas are common. Wolves occur sporadically, especially round Homs and Sannin and on Sannin's top. The last place is a home of hares, of which they told me at Neba Sannin a story that might have come out of Herodotus. The village is deserted in winter, when snowdrifts bury the orchards. The hares come down and eat the bark, scraping away the snow. This is not good for the trees. Bludan keeps a few martens, and many foxes. I expect there are no gazelles in Esdraelon now; it is a vale of thriving Zionist colonies, and improvement on its old wastful savannahs of wild lilies.

For there as wont to walken was an elf
There walketh now the limitour himself.

But gazelles abounded in 1919, as elsewhere; I flushed one from the bosky fringe of a brackish Dead Sea pond. During the War the Germans found a wild cat in the Wadi Kelt, that was thought new to science. Probably it was our old friend the Indian jungle-cat, which I saw one day in 1919, when I was going over the marble columns of Roman Apollonia (Arsuf), where my unit had held the coast previously to Allenby's break-through. And there are ostriches in Transjordan. Did not the first party to motor from Jordan to Baghdad tell us recently how they chased a small flock of five or six and left one dead on the sands?"

Dr. Jonathan Dwight, a charter member of the society, died February 22, 1929, in New York, where he was born December 8, 1858, and where he spent most of his life. He received his A.B. degree from Harvard University in 1880, and completed his medical training in the College of Physicians and Surgeons, Columbia University, in 1893. Doctor Dwight was an ornithologist of note, and birds absorbed nearly all of his zoölogical attention. Nevertheless, he manifested a friendly interest in the work and workers in other groups, and his willingness to help worthy causes prompted his activity in many fields.

Robert Ridgway, curator of birds in the U. S. National Museum, died at Olney, Illinois, March 25, 1929. Mr. Ridgway was born at Mount Carmel, Illinois, July 2, 1850, and in early boyhood became interested in natural history. He was naturalist on the 40th Parallel Survey under Clarence King, from 1867 to 1870, and reported on his collections in 1877. Mr. Ridgway published over five hundred papers and books on birds, and several botanical papers. His work of chief value to mammalogists is his "Color Standards and Color Nomenclature," issued in 1912, and used worldwide as a standard for color comparisons in mammals.

William Lyman Underwood died January 28, 1929, at Belmont, Massachusetts, where he was born March 4, 1864. He left school at the age of sixteen years to enter his father's business, William Underwood Company, canners, of which firm he was director at the time of his death. In 1896 he began lecturing on bacteriology as applied to the preserving industry, on mosquito, gypsy moth, and brown-tailed moth problems, and on wild life. Since 1900 he has been lecturer in the biology department of the Massachusetts Institute of Technology. Professor Underwood was a lover of mammals, and rarely was found without wild animal pets at his Belmont home. His account of one of these, a black bear, as told in his book "Wild Brother," is a literary masterpiece.